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AGRICULTURE, SHIKAR & TRAVEL

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[No 1.

Cardamoms in Coorg.

The Cardamom cultivated in Coorg is the *Elettaria Cardamomum*, and though the trade, so far as native cured fruit is concerned, is steadily falling, still the cardamom is an important article to the people and is certainly the cause of much thought and anxiety to the Administrators of this little Province.

I will not give any botanical description of the cardamom in this article nor will I refer to the other kinds which are not utilised, but endeavour to give an idea of the habitat of the plant and the methods of curing it followed by the people, with a few remarks on the state of the cardamom trade.

The cardamom grows best on the Western and Northern slopes of the ghats at an elevation of from 3,000 to 5,000 feet above the sea. Here the full burst of the monsoon strikes the steep sides of the hills and the rainfall reaches as much as 300 inches in some parts. It grows spontaneously, but is one of those peculiar plants, the seed of which lies dormant till induced to germinate by the occurrence of certain conditions. One of these is the admission of light. Cardamoms will only be found in the dense evergreen forest, and the ordinary method of inducing them to appear is to open a small space in the forest by felling one or two very large trees. Not only does this admit the light but the fall of the trees shakes the ground and breaks the surface. So thoroughly is the necessity for the shaking of the ground believed in, that when a plot is selected, all undergrowth, small trees, &c. which might interfere with or break the fall of the giant selected for destruction, are cleared away so that the tree may descend with all its weight and momentum: and to intensify the effect, the tree is always felled so as to face down hill. As these plots are almost invariably situated on the steepest hills, the effect of the fall of one of the enormous trees so common in the Ghat Forests must be very grand.

A Cardamom Estate is called a "malé" and the ordinary method of cultivating a "malé" among the Coorgs, is to open out

a certain number of these plots within the limits of the same. The plots are necessarily small, for only a limited amount of light is required and a plot too large, in addition to admitting too much light, would also allow of evaporation from the soil to an injurious extent. In the leases given for "malés" the maximum size of each plot is fixed at one-sixth of an acre and at least thirty feet of forest must be left between any two plots. As a rule not more than two trees are felled and oftener only one. The felling generally takes place in February or March in the year and by the rains the young plants shoot up. They require weeding at least once before they begin to yield, which takes place in the third year. The plant continues to bear for seven or eight years, the fourth and fifth and sixth of its age being its best. When it begins to cease bearing, either a new plot is selected or another tree is felled which seems to give a fresh start to the plant.

The position of these "malés" is generally so remote and inaccessible that the picking of the crop is undoubtedly no easy task. In fact, the Coorgs lose a large proportion of the crop, for the fruit begins to ripen as early as July, while they never attempt to pick before well into September. The tremendous rainfall not only, in itself, deters them from penetrating the hills, but renders the numerous streams and torrents impassable. Indeed, on the exposed slopes of the Ghats, life would scarcely be liveable in the height of the monsoon. As it is, the leeches in these forests throughout the autumn and cold weather months must be seen to be appreciated, and in addition to these drawbacks, the steepness of the hills is such that walking is difficult. When climbing about these "malés" one can quite comprehend the feelings of a fly walking up the side of a house.

The cardamoms are picked and sun-dried. If the malé is far from the village, the drying takes place on the spot, otherwise the capsules are taken home. Four days sunning is sufficient, care being taken that they do not get wet and that they are not over exposed, as this latter would cause the capsules to burst. But beyond this open air drying, no further curing takes place. The fruit stalks are rubbed or picked off. In this part of the process, it is wonderful the number of capsules a practised hand will clean in any given time. The capsules are then assorted according to size and colour and stored away till disposed of. But a better system of both cultivation and curing has been introduced into Coorg by an English planter in the ghats. I am much indebted to Mr. Finlayson for his having put at my disposal the necessary information concerning his treatment of cardamoms. In the first place, the cardamom plant is raised from seed in a nursery and the plants are put out in a compact plantation, instead of being allowed to grow spontaneously in scattered clearings. The first step is to prepare the area which is to be made into a cardamom plantation. This is done by thinning the shade. The amount of thinning can only be determined on the spot and is guided by experience. The

aspect chosen is generally North or North West and the most favourable places are the moist hollows and ravines. The undergrowth is cleared, and planting is done in June and July, from nursery plants raised from seed, supplemented by bulbs from old stools. Mr. Finlayson prefers the latter as growing better. The plants are put out at 7 feet by 7 feet, not deep in the soil. The plants are put into shallow pits which have been filled with surface mould, the soil is pressed round the half exposed bulb and the plant tied to a stake.

These Cardamoms yield a small crop the third year after being put out and they do not come into full bearing until the fifth year, thus there is no advantage in time in this method of cultivation. The yield then is about half a seer to each plant. Thus an acre would give about 475 seers, or say, 950 pounds; under half a ton. The picking lasts from July to January, September and December being the busiest months. The first crop always yields the largest fruit.

Before preceeding to give Mr. Finlayson's method of curing, I will venture on a comparison of the advantages resulting from the two systems of cultivation, the native one by means of isolated and scattered openings in the forest, and the English one of a regular plantation. As to the former, the only advantage that can be claimed, and I am not certain that the claim should be allowed—is that it does less harm to the forest which, as the Ghaut Forests should be preserved for climatic reasons, is a very important point. Mr. Dickinson, whose knowledge of the conditions of cardamom cultivation owing to his personal inspection of the malé and ghaut forests is unique, is in favour of the native method on the ground of less damage being done to the forest. He argues that the partial clearing of the high forest over a comparatively large area accompanied by the removal of the undergrowth, tends to set up scouring and that the soil will be all washed away. But the drawback to the native system is the difficulty of supervising the work and of enforcing the rules as to the size of the plots and the width of the belt of forest to be left between each plot, and though it is in the interest of the malé holder not to open the forest to too great an extent, it is a question whether, with the low prices ruling in the cardamom market, the urgent necessity of raising a large crop will not, and does not, tempt malé holders into over-felling, leaving the future to look after itself. Where a forest has been over-felled under the native system, the damage is practically irreparable. It is with very great diffidence that I differ from one so well up in the subject as Mr. Dickinson, but I have seen both systems of cultivation and taking all the conditions obtaining, I am decidedly in favour of the English method of cultivation, as it is more easily and effectually supervised, it concentrates the damage done into a smaller area, the crop is more easily and more cheaply picked and the whole working of the estate more in accordance with science.

Mr. Finlayson dries the capsules partly by exposure to the sun and partly by artificial heat. The former is the better method, but, owing to the uncertainty of the weather, the latter, in the end, pays better. The cardamoms are bleached by exposing them to the dew for a couple of nights and then fumigating them with sulphur. Mr. Finlayson is naturally somewhat reticent as to the process his cardamoms pass through, for the supply is large and the market restricted and the competition from Ceylon, Travancore and Mysore is keen. Before picking, the capsules are carefully sorted and clipped. I am unable to give the cost of cultivating, picking and curing the cardamom under this system. It is finally packed in boxes and sent to the market.

The price of cardamoms has been steadily diminishing of late years. Rs. 14, to perhaps 'in a few instances' Rs. 18, per maund of 28 lbs., is the average selling price of native-cured cardamoms. The English cured sell from Rs. 1-8-0 to Rs. 2-4-0 per lb. The system in force in the days of the Coorg Rajas as regards the disposal of cardamoms was that the whole crop was handed in to the Government, who paid the cultivators a fixed price per maund and sold the crop for itself. The price paid was from Rs. 12 to Rs. 20, per maund. This was continued after the annexation of Coorg until 1846, when the malés were put up to auction and they are now leased, tenders being invited for a certain period of years. There is another class of malé in Coorg the Jama malé—the holders of which have a right to the produce on payment of rent which is assessed on the estimated yield.

The prospects of the native cardamom cultivators are extremely gloomy. Owing to several causes, the cultivators have been having a bad time of it lately. Falling prices, the enfranchisement of their slaves which necessitates payment of labour, and bad seasons, have all combined to render it impossible for many of the lessees to pay the rent they covenanted to six years ago. So bad has been their condition that the Local Government has had to allow a large number to resign and the condition attached to the acceptance of the resignation *viz.*, the payment of all arrears, has been found difficult to enforce.

It is a matter of extreme regret that a comparatively large number of families should lose their principal means of livelihood, but it is useless for the State to endeavour to oppose the laws of economics. Want of capital prevents these small malé holders from cultivating and curing their cardamoms in a paying way. The outturn is so poor in quality that it necessarily fetches a very low price when the beautifully cured capsule of the English grower is competing with it, and the problem will soon work itself out with this result, that the producers of native cured cardamoms will become fewer and fewer, until the produce they put on the market only suffices for the demand. For, strange to say, despite its inferior value and condition, there is still a demand for this kind and always will be, as long as there are people who, though desirous

of purchasing, can only afford to pay low prices and must therefore, perforce, put up with an inferior article. The slow extinction of the male holder is a serious loss to the Forest Revenue, but, I fear, go he must, and the Department must look around for some fresh source of revenue to make up the deficit.

G. H. FOSTER.

ON CERTAIN EXPERIMENTS

MADE IN THE

Forest Nursery at Bellefontaine (near Nancy.)

by E. BARTET, *Inspecteur Adjoint des Forêts.*

The facts set forth in the following notes are the results of experiments carried out in the Bellefontaine Nursery on the raising of plants for forest planting. The nursery which was established in 1863 in the Forêt de Haye, nearly four miles from Nancy, and whose situation is defective from several points of view, constitutes one of the experimental stations attached to the Nancy Forest School.

Whether the observations which I have collected contain anything new and hitherto unpublished, and whether the reader will find in them anything other than the confirmation of facts already made known, I do not venture to affirm, so considerable are the numbers of works carried out in France and elsewhere on the subjects herein dealt with.

(1). ON THE USE OF SAWDUST AND PEAT FOR COVERING SMALL SEEDS.

At Bellefontaine, for covering small seeds, a mixture of mould leaves, well decayed manure and sifted earth, has for a long time been used. The preparation of such a compost is costly, the use of it has also other inconveniences, for when a period of drought follows after prolonged rain, it gets hard and forms a crust liable to interfere with the growth of small plants.

These considerations led me to try whether, for covering the seeds in question, sawdust and peat could not be used, these being two substances often obtainable in abundance and at a low price in the neighbourhood of forest land.

The first experiment to this end was made in April 1887 :— six trenches each 30 feet long being sown with Spruce Fir. The following were compared :—

1. Sawdust of Poplar, alone.
2. Peat alone.
3. A mixture of one part Poplar sawdust and one part mould.

4. A mixture of peat and leaf mould, in equal quantities.
5. A mixture of peat and sawdust, also in equal quantities.
6. The usual compost consisting of one fourth part leaf mould, one fourth decayed manure and one half well sifted mould.

Before using the sawdust, it was carefully saturated with water.

The results were quite as satisfactory in Nos. 1 and 2 as in the other lines and that as much so during the period of germination, as during the rest of the season of vegetation. It was even noticed that under nothing but sawdust, the seedlings of Spruce made their appearance earlier and more completely than anywhere else.

In the spring of 1888, another trial was made of the comparative effects on Spruce seed of sawdust alone and of the compost above mentioned, No. 6. The advantage was again on the side of the sawdust, although this had not been specially watered before using, it having been simply exposed to the rain for six months.

Finally, in the same year, 1888, the best and most conclusive results were furnished by a trial made on Spruce seed of very fine sawdust, not made from species such as Poplar, but from Oak. In spite of its being watered every two days, the working of the tannin into the soil in no way retarded either the germination of the seeds or the subsequent growth of the living plants.

It is therefore almost certain that sawdust derived from almost any species whatever might be employed in this way, provided that it is well saturated with water at the time of its being used.

When the sowings are made in lines, rather less than a pint of dry sawdust is required for a foot of trench.

(2). ON SOWING OAK SEED IN AUTUMN.

The following process which is both simple and economical, has been entirely successful each time I have tried it. The sowing is made immediately after the natural fall of the acorns.

To preserve these from the attacks of rodents, they are coated with redlead by shaking them up in a bag or basket of this after wetting them.

After the acorns, well covered with this protective coat, have been dried, they are sown in trenches $1\frac{1}{2}$ to 2 inches deep, about an inch of sawdust (wet or dry) well pressed down, being first placed over them and then about an inch of earth over that forming a slight mound. Thus protected, the acorns suffer nothing from the cold and the young plants appear at the beginning of June with the greatest regularity.

(3). ADVANTAGES OF SOWING BIRCH SEED IN AUTUMN.

It is well-known that many authors recommend sowing Birch in autumn immediately after the ripening of the seed, in order to prevent its losing its power of germination. The experiment shows how thoroughly this advice was justified for the autumn sowing gave ten times as many plants as the spring sowings.

(4). DESTRUCTION OF MOLE CRICKETS.

Ever since I have had charge of the Bellefontaine Nursery, I have had to deal with a formidable invasion of mole-crickets which has given me the opportunity of experimenting on the various methods recommended by experts for the destruction of these pests.

With the exception of hunting for their nests and for the holes in which they take refuge, the only method which has been successful is that which consists in placing small pots with smooth and almost vertical sides, in the earth, in such a manner that the insects may fall into them in the course of their nocturnal ramblings.

To place these traps along all the galleries would be practically impossible, when one has to deal with thousands of these enemies. In such a case it is found best to proceed as follows.

The parts most infested should be enclosed with boards placed edgewise and buried $1\frac{1}{2}$ inches in the soil, about 1 inch of their width remaining above ground. When the area thus enclosed is more than 120 square yards, it should be divided into compartments by a number of boards similarly disposed to those above mentioned.

It is then all along the sides of these boards inside and out that the pots are placed at 15 to 20 ft. distance one from the other taking care that the edge of each pot is a little below the level of the soil and that it touches the board very exactly.

In constructing their galleries the mole-crickets run against the planks and turn aside along these until they fall into the traps laid for them and from which they can be collected every morning.

The pots of the shape of an ordinary plant pot are the best, they only need to be about 6 inches deep and about the same width at the top, the bottom having a diameter of about half that. The hole to receive these can be conveniently made with a piece of wood previously prepared to the required shape and size.

It is perhaps superfluous to add that if ordinary plant pots are used, the hole at the bottom must be plugged up with something sufficiently hard to prevent the insects getting through.

Pots with thick rims should not be used, as with these the edge of the pot cannot be placed exactly against the plank.

Finally the pots must be kept free from earth, leaves and rubbish or the insects may escape.

(5). TRIALS OF CHEMICAL MANURES.

..... The results were not conclusive.

(6). TREATMENT OF THE RED DISEASE IN PINE LEAVES.

At the commencement of the year 1888, I published, together with Doctor Paul Vuillemin, the result of experiments showing the efficacy of copper compounds for preserving the Scotch Pine against the "red" disease which is due to the attacks of the fungus *Histerium Pinastri*, (Schräd.) which affects exclusively the leaves of the year.

In these first experiments of 1886 and 1887 I restricted myself to the Scotch Pine, and the Bordeaux mixture used in these experiments contained according to the primitive formula of M. Millardet, 16 pounds of sulphate of copper, 32 pounds of lime and about 3 lbs. of isinglass to about 22 gallons of water. This paste was applied to the plants like whitewash, twice a year, with broom or brush.

On continuing the study of this question, I ascertained that at Bellefontaine the Black Austrian Pine was affected almost in the same degree as the Scotch Pine and that the seedlings of these species were liable to be attacked and killed by the fungus within the year of their germination. I also made fresh trials to compare different copper compounds and different modes of employing them also varying the number of applications per annum.

These trials, of which the details cannot be enumerated here, led me to the following conclusions.

1. Of the various formulæ of Bordeaux mixture capable of being utilized, the two following gave the most satisfactory results.

No. I.	{	Sulphate of Copper	...	...	lbs. 8
		Lime	...	...	" 8
		Isinglass	...	...	" 2½
No. II.	{	Sulphate of Copper	...	...	" 12
		Lime	...	...	" 8
		Isinglass	...	...	" 2½

Both the above are quantities per 22 gallons of water. Formula No. 1. should be used for the first or two first applications made at the beginning of the season of vegetation, when the young needles are still young and might suffer from a too concentrated wash of the sulphate. Formula No. II should be used in subsequent applications.

In raising the quantity of sulphate of copper to 16 lbs. without increasing the amount of lime, I noticed that the leaves were burnt.

2. Burgundy mixture (sulphate of copper, and carbonate of soda 2½ lbs. of each to every 22 gallons of water) I found less efficacious than the Bordeaux mixture, probably on account of the smaller proportion of sulphate used.

3. Copper sulphosteatite (made by mixing powdered talc, sulphate of copper and water) much used by vine growers in the South of France to prevent mildew, gave but poor results in spite of

washings made every 15 days. The smooth leaves of the Pine are not able to retain this powder long in the wet climate of Bellefontaine.

4. The Bordeaux mixture can be applied either like white-wash with a brush or by means of a sprinkler such as is used for the treatment of mildew in the South. What is important is that each leaf should receive a wash of the mixture.

The use of a sprinkler is the more economical mode.

5. In dealing with either Scotch Pine or Austrian Pine, treatment with a view to the prevention of the red disease should be begun while the plants are yet in their first year of growth and must be continued so long as they remain in the nursery.

For seedlings, under one year old, the first application of the mixture is made a few days after the appearance of the plants above ground; for those of one year old or more it is better to wait till the new needles have attained about $\frac{1}{3}$ of their length. The other applications are made at intervals of three weeks or a month; they should be more frequent at the beginning of the season of vegetation than in the middle of summer; exceptionally abundant rain may also render more frequent applications necessary.

At Bellefontaine, where this disease has prevailed for some time and has exceptionally favourable conditions for its propagation, 3 or even 4 applications should be made every year, when the latter part of the spring and the beginning of the summer are wet.

(7). SEED OF THE WEYMOUTH PINE.

..... Weymouth Pine seed should not be sown in a Nursery without first putting it through a process of preparation by some method or other of 'stratification.' This is excellent advice and I think with M. Pierret (the author of the above) that the practice of stratification would be of great advantage for many other species as well, both broad-leaved species and conifers, and more particularly for the larch and beech.

So far as concerns the Weymouth Pine, each time I have sown it, after simply having submitted the seed to immersion in water, the results have been unsatisfactory, even with a previous immersion of 15 days, the soil also being irrigated. Under such conditions, sowing the seed at the end of April or commencement of May, I have always noticed the following peculiarities.

Germination took place slowly, commenced before the middle of June, and continued until August, the crop of seedlings being anything but abundant; the seed is thus exposed for some time to the attacks of rodents and birds. Moreover, whatever precautions are taken, several of the young plants are destroyed as they appear, either by birds or by the heat, whereas those that come up latest succumb to the cold of winter. Finally, only about 17 plants remain per square yard of ground sown. As compared with this, last year I obtained a most successful result by means of stratification carried out as follows.

In order to avoid any chance of mould later on, the seeds were first placed in a solution of sulphate of copper (3 per cent concentration) for 24 hours, then on the 12th of March, the seeds were spread in a bed $\frac{1}{4}$ inch thick between two layers of wood sawdust well wetted, each layer being 1 to $1\frac{1}{2}$ inches thick.

The box containing the whole was then placed in a room dimly lighted and not warmed, care being taken to maintain the moisture of the sawdust by occasional light waterings.

On the 14th May, *viz.* two months later, the first signs of germination appeared. The seed was then separated from the sawdust and sown in trenches. In less than 15 days the young plants came up in masses in as great abundance as is the case with Scotch or Austrian Pine.

(8). PECULIARITY OF ELM SEED.

It is well-known that when Elm seed is sown immediately after its dissemination (May or June), the young plants appear after some days. To obtain the best results, the seed has, however to be covered but lightly.

If, on the contrary, the seed is covered with a layer of $2\frac{1}{2}$ to $2\frac{3}{4}$ inches of earth, as I covered it in an experiment made in 1890, but few plants appear in the same year, the majority of the seedlings coming up in the spring of the year following the sowing. Moreover, the total number of plants obtained is less than that furnished by the method of covering lightly.

Perhaps the above may be of use in arriving at some practical method of preserving Elm seed.

(9). CUTTING BACK OF BADLY GROWN OAK PLANTS.

The Oak plants referred to here were taken out of the Nursery at Bellefontaine when one year old and replanted in a temporary nursery in the Forêt de Haye where, during the two following years (1885 and 1886), they were so seriously damaged by spring frosts that the stems of many of them practically did not develop at all.

Towards the end of April 1887 it was considered necessary to transfer them to another temporary nursery less exposed to frost than the first.

The smallest and most badly grown of the plants (many of which were barely 3 inches high) were cut back level with the ground immediately after transplanting, while the larger ones, measuring 8 to 10 inches were transplanted and left just as they were.

Two years later the shoots of those which has been cut back constituted a group as vigorous and of as favourable an appearance as the others. It was even among them that the largest plants were to be found.

The result of the cutting back was therefore excellent. It must always, however, be remembered that if this operation it

intended to re-establish equality in the size or more correctly in the height, of the stems, it is not capable of producing the same effect in the weight of the plants. This is shown by the following figures furnished by two groups of eight oaks thoroughly representative of the two lots compared.

	Plants which were cut back.	Plants not cut back.
Average height of stem above collum ...	21 in.	21 in.
Average weight of an air-dried plant (stem and root) ...	$\frac{3}{4}$ oz.	1 oz.

This difference in the weight of the plants arises from the root system as well as the aerial organs, for plants which were not cut back were manifestly more thick set, better branched and better provided with roots than those which had been cut over.

(Translated and abridged by A. F. G.)

NOTE.—It is perhaps hardly necessary to remark that the inferiority of the root system of the plants of the first lot should not be attributed to the operation of cutting back, for not only did this inferiority exist at the time of the operation but it was much more pronounced then, than at the time of the weighing above referred to.

The Cutch tree in Upper Burma.

At present the only protection afforded to Cutch is (i) it may not be felled for sale or use as fuel ! (ii) no cutch trees under three feet in girth may be cut for cutch boiling. With these two exceptions, Cutch trees may be cut wholesale for sale or use as house posts, cart-axes, &c.

This hard-and-fast sort of girth restriction is not capable of practical application. Right in the centre of Burma, from the north of the Magwe, Minbu and Pyinmana districts up to the north of the Mandalay district, there is a 'dry zone' embracing the eastern parts of Minbu, and Pakokku, the South of Sagaing and Mandalay, the western parts of Kyaukse, and the whole of Yamethin, Meiktila and Myingyan. With this dry zone there are hardly any true forests, as we are accustomed to find them in the moister parts of Burma. Where not under cultivation, the soil is covered with an open scrub jungle in which many species of *Acacia* are noticeable. Even with the isolated positions of the stems and the consequent full development of crowns, with full enjoyment of light and air, the rate of growth and the development of and quality of the cutch-producing heart wood are both inferior to that in the moister tracts of South Pyinmana, southern Magwe, and western Minbu. In the district townships of these dry-zone districts, or where the soil is not good, it is more than questionable if the Cutch ever attains anything like the large girth which would make the fixing of a three feet girth a reasonable minimum below which the felling of green

trees should be prohibited. From observation it has been noticed that in many tracts the trees dry and die without reaching that girth. In fact it is open to considerable doubt if the catch generally occurring there may not be another species than the true *Acacia Catechu*,—a view which is corroborated to a certain extent by Kurz, at page 422, Volume 1, of his "Forest Flora of British Burma."

With a view to establish comparisons as to rate of growth of catch, the following data have recently been collected :—

District.	Character of Forest.	Quality of wood.	No. of Annual Rings.	Girth.	Diameter of heart wood.	Average annual girth in amount.
Dry Zone.						
Yamethen...	Dry open forest	Lighter than Pynmana	8	0' 9½"	...	1' 2"
	" ...	Ditto ...	15	0' 11½"	...	0' 75"
	" ...	Ditto ...	rotten.	3' 0"	...	(?)
	" ...	Ditto ...	15	3' 3"	...	2' 8"
Meiktila	Scrub jungle much cut over for Ry. fuel in 1887	Medium in colour	7	1' 1"	...	1' 9"
	" ...	Light in colour	5	1' 2½"	1½"	2' 9"
	" ...	Ditto	5	1' 1"	1"	2' 6"
	" ...	Ditto	5	1' 1½"	1½"	2' 6"
	" ...	Medium in colour	9	2' 2½"	5½"	3' 0"
	" ...					
	" ...					
	" ...					
Intermediate zone.						
Meiktila ...	Scrub jungle near base of hills on good soil	Light in colour, Rings very indistinct.	15(?) 19(?)	2' 7" 2' 10"	7½" 7½"	2' 0" 1' 8"
Yamethen...	Mixed forest, verging on moist zone	Resembling specimens from South Pynmana	15	3' 7"	...	2' 8"
Moist zone.						
Pynmana...	Lower dry forest	Lighter than specimen from Minbu	7 9	2' 4" 2' 6½"	...	4' 0" 3' 3"
	Mostly coppice	.....	7	2' 2"	...	3' 7"
	Growth in pónzón	.....	9	2' 9"	...	3' 6"
	Lower mixed forest	Ditto	11	3' 2"	...	3' 4"
	Lower (different locality)	Ditto	12	3' 3"	8"	3' 2"
			9	3' 4"	9½"	4' 4"
	Savannah forest.	Ditto	9	2' 4"	...	3' 1"
			9	2' 8"	...	3' 5"
			11	3' 2"	...	3' 2"
Minbu ...	Not stated	Heart wood dark, almost chocolate coloured and full of "ugyi" Annual rings very indefinite	11(?) 14(?)	2' 7" 3' 2½"	6½" 8"	

Imperfect and incomplete as these hastily collected data are, they show that, on the whole, growth in the moister tracts is considerably quicker than in the dry zone, and that the heartwood in the former appears richer in cutch than in the latter. In the former, a girth of 3 feet is attained after about 10 to 12 years with a diameter of about 8 inches of heartwood.

The Pyinmana specimens shew somewhat quicker growth but not such rich heartwood or abundance of 'u-gyi' (cutch cells) as those from Minbu. This is probably due to the fact that the taungya system of cultivation is more generally preserved in the former, and that the bulk of the existing supplies of the timber is obtained from coppice shoots. Cutch is decidedly light-loving, and when coppice shoots get the full enjoyment of light, air and sunshine in pônzôs (old clearings) they grow with great rapidity; seed too then gets a chance of germinating on the clearance of the over-shadowing canopy.

This fact of the existing supply of cutch wood being located in tracts where taungya cultivation is general in the Pyinmana and Yamèthen districts, would point to the advisability of reserving cutch tracts. This, however, the Deputy Commissioner does not approve of, as the land is all practically of culturable quality, in proximity to the railway line, and likely to be required for permanent agricultural occupation at no very distant date. Even the Forest officer writes that he sees "little possibility of having the greater part included within reserved forests." In the Pyinmana and Yamèthen Districts there are from 30 to 36 thugyiships (revenue circles) in which cutch tracts occur, and if it were only possible to open 3 of these each year for cutch boiling and taungya cultivation simultaneously, so as to work with a 10-12 years' rotation, we should always be certain of a good supply of cutch. The trees coppices up to 3 feet girth, although it is questionable if they can reproduce themselves from the stool beyond that age, and seed is shed from about the 5th to the 6th year. As, however, the villages, whose inhabitants adopt taungya cultivation partly, are permanent no such system can be introduced. At present, thousands of saplings and young trees are killed year after year by the firing of the yas even when the cutch is not felled along with the rest of the jungle at the time of clearing.

On the Magwè side, the cutch tracts have been overworked to such an extent that all cutch boiling has this year been stopped to allow the localities to recover themselves. On the Pyinmana and Yamèthen side, the tracts have also been much overworked during the last three or four years, but in order to alleviate the distress that is certainly wide-spread among the forest classes this year, this overworking is being continued (within certain limits) this year also,—only however for the benefit of actual residents. Recent valuation surveys in the Pyinmana district shew only the following stock :—

VALUATION SURVEYS.		No. OF CUTCH TREES.			AVERAGE No.
No. held.	Area counted out in Acres.	3' in girth and above.	Under 3' girth.	Total.	Per Acre.
45	1,814	146	5,977	6,123	3.37

A great deal of the cutch produced in the Meiktila and Mandalay districts is 'shu byāw' (soft cutch) and not 'sha-mā' (firm cutch) It is sent to Rangoon, consigned to Chinese firms, in its semi-viscous condition, looking like thickened crude earth oil, and there re-boiled along with other hard cutch—or probably with *than* (*Terminalia Oliveri*) bark, or bark extracts if the truth were known.

The following data relative to the outturn of cutch have been collected for me by Mr. Copeland, D. C. F., Pyinmana :—

1. A prepared log, *i.e.*, freed from bark and sapwood, of 8'3" × 1'10 $\frac{1}{2}$ " yielded chips filling 8 $\frac{1}{4}$ chatties tightly packed.

2. Twenty chatties of cutch chips, decocted twice, as usual, yielded in 24 hours 5 viss 70 tolas of viscid cutch, of quality below medium and selling in Pyinmana at Rs. 32 per 100 viss.

3. Transport of cutch from camp to Pyinmana is from 8 annas to Rs. 1 per 100 viss.

4. The preparation of the cutch log took 1 man $\frac{1}{2}$ an hour, and the chipping 3 $\frac{1}{2}$ hours. It is considered a fair day's work for a man to prepare and chip enough wood to keep one cauldron going. His wages may be reckoned at 8 annas per diem.

5. The cost of delivering in camp 100 logs similar to that in No. 1, is Rs. 15.

6. Additional help is required for tending the cauldron, generally the wife of the chipper, who may be reckoned at 4 annas per diem.

Deductions from the above data are :—

1. Each cauldron uses up 5.34 cub. ft. (true measurement in short sections) of heartwood per diem and produces 5.70 viss of cutch.

2. The cost of production of 5.70 viss of cutch is :—

Delivering timber	...	Rs.	0	6	0
Chipping heartwood	...	"	0	8	0
Tending cauldron	...	"	0	4	0
Packing in cases of baskets	...	"	0	1	0

Total Rs. 1 3 0

3. The market value of the 5.70 viss of cutch at Pyinmana, at Rs 32 per 100 viss, but deducting Rs. 1 for transport from camp, is Rs. $5.7 \times 31 \div 100 =$ Rs. 1-12-3.

4. The nett profit per diem after allowing wages to the worker, his wife, &c., amount to Rs. 0-9-3, or Rs. 15-0-6 per month of 26 working days.

5. The amount of cutch timber consumed in a year of 200 working days would be $5.34 \text{ cub. ft.} \times 200 = 21.36$ tons of heartwood or of growing timber = 50 tons probably. In a year of 270 days, $5.34 \text{ cub. ft.} \times 270 = 28.84$ tons of heartwood or of growing timber = 66 tons probably. Under the circumstances described, it seems the best thing that Catechus should be declared a reserved tree, and that licenses for the preparation of cutch should be issued subject to the following conditions :—

- (i) No license to be issued for more than one cauldron, and no individual to obtain more than one license.
- (ii) Licenses only to be issued to villagers resident in the township where the cutch boiling is to take place.
- (iii) No license to be issued to any one who has a license for the preparation of bark extracts.
- (iv) License fee to be Rs 5 p. m. prepaid monthly.
- (v) No green catechu trees to be cut less than 3 ft. in girth at breast height, except in such districts, and only in such townships of said districts, as may be sanctioned from time to time by the Conservator of Forests.
- (vi) Contravention of rules at any camp to involve forfeiture of all the cutch boiling licenses at said camp.

Hitherto, in a great many instances, licenses have been taken out by men from lower Burma who simply employed the coolies on job work paying them about Rs. 4 per 100 viss of cutch and giving them food-supplies during time of cutch production. For this reason a monthly prepayment fee is proposed, instead of a lump sum, thereby probably enabling the villagers to have licenses independently of brokers and middlemen.

J. N.

A Japanese Timber Slide.

When in Scotland in 1884, I visited the Edinburgh Forestry exhibition and among the many interesting exhibits from Japan, noticed a model of a timber slide, a few notes on which may not be uninteresting even so late as now.

wall, against which the timber strikes violently on turning and is prevented from moving out of the proper course. In this way

The model showed the way in which timber is transported out of deep mountain forests. When the trees of the genus *Pinus* are felled and dressed into baulks they are collected in one common place, which is called 'Seridashi.' From this place they are to be transported out by means of an elevated floor known as 'Sade.' This is constructed by the side of a declivity where the transport becomes very difficult on account of the road being very narrow and uneven. In the first place, a kind of gate is built with two large pieces of timber which cross each other at the top and against this gate timbers are inclined forming a sort of fence called 'Tome' meaning "timber obstructor." One day this gate is closed to collect timbers and on the next it is opened to send them to the Sade, so that the gate is shut and opened on alternate days. Just outside the Tome or gate, timbers are horizontally arranged for 6 or 8 yards, called 'shura' and this is continued as far as the Sade proper. For the construction of the 'Sade' a support called 'Toridai' is first built of two pillars to which a horizontal beam called 'Udeg' 2 to 4 yards long is fastened. Such supports are built at the distance of 6 to 8 yards from one another, their heights being altered to form the desired inclination. Then a long piece of wood called 'Sao' is stretched from one Udeg of one support to that of another on both its sides and the distance between two Sao is about five feet. Across the Sao trough shaped timbers called 'Tonkase' are fastened; and parallel with them, beams of three to four inches diameter are arranged at the distance of one foot from each other. These latter are called 'Yorai' and twigs of 'Hinoki' (*Thuya dolabrata*) are woven across them, the ends of the twigs always projecting below, so as to leave the upper surface smooth. These are then firmly fastened by timbers fixed on both sides called 'Kateji.' The space between two Kateji is about three feet, and this forms a floor on which the timber slides down. Such an arrangement is known as 'Tamba Sade.' There is another called 'Nora Sade' in which the sliding surface consists of 'Sawara' (*Thuya pisifera*) boards one foot four inches broad and 4 feet five inches thick instead of net-work. In both cases Kateji and Tonkase are supported by pillars to make them firm. 'Tamba' Sade is constructed at those places where the inclination is not very great, while the 'Nora' is better fitted for greater inclinations. For bending the course of the sliding floor, an arrangement known as 'Usu' is provided. This consists of a sort of elastic wall built of the bark of the *Thuya dolabrata* at some distance from the Sade and in front of this wall a pole inclined at an angle of about 45° called 'Suribo' is provided. Now a piece of timber on coming to the extremity of the sliding floor dashes against the wall or usu, but one of its ends rests on the inclined pole or Suribo, so that this end immediately slides down the pole and enters on a second floor. There is another inclined pole called 'Koshinchibo' by the side of the

4 to 5,000 pieces of timber can be transported in a day. Sometimes, however, timbers get stopped on the way, hence labourers are distributed here and there to manage them. There are also two or three persons stationed at high places, who watch how the timbers get down and in case they slide down too fast or if there happens to be any obstacle, they report the matter to the Tome to send out wood more slowly or to stop entirely. In case of Nora Sade, the velocity of the sliding timbers is great and they often jump out of the proper course, hence, to obviate this inconvenience, an arrangement called 'Noren' is provided, which is made by hanging timbers from a cross-bar built over the floor, so that their ends rest on it, and the pieces on sliding down must creep under them: thus the velocity gets much slackened, and their falling off is prevented. If, on account of the inclination of Sade being too great, the timbers slide down too fast the floor is covered with fine earth which, causing friction, slackens the speed—if the contrary be the case, water is sprinkled on the surface to make the timbers slide quicker. The construction of Sade requires a great deal of material as well as of labour, so in places where there is a stream that can be made use of, advantage is taken of it even for a short distance and the mode of transport under such circumstances, goes by the name of 'Shura-dashi.' For constructing it, timbers are first piled in a slightly concave form at the extremity of the sliding floor. When timbers that are sent down are collected all along the sides of the stream, other timbers are arranged longitudinally, and to make the water as deep as possible, a weir is built at the lowest part by piling up timbers in many layers called "Segi." This consists really of two parts, the lower and the upper, called respectively 'Takasegi' and 'Uwasegi.' The lower one is made by piling up timbers horizontally and the Uwasegi is constructed by heaping timber in a slanting position. All the crevices through which water flows are carefully stopped by inserting weeds, tufts of moss or leaves of plants, and by this means the shura is watered as far as possible, and timbers sent down and when they come to the segi or weir they are transferred to the next shura by men. All the timbers used for the construction of the several parts are eventually themselves brought out, commencing with those at the uppermost place. Sade and Shura are most economically used for the transport of about 30,000 timbers, because the expenses of construction and the number of men required are the same for as for a less quantity of the timber. But if the number of the pieces of the timber to be dealt with comes to as many as 40,000 or 50,000, many things get mixed up and cannot be managed properly. The whole construction requires a most experienced person to manage it, otherwise, not only is much time spent in transport but many parts happen to break and during the time of mending, labourers must be paid without any work to do, which causes a great loss.

R. C. W.

II.—CORRESPONDENCE.

Forest Administration in the Central Provinces

SIR,

“ Tuscan,” in your October number, though he, in the beginning of his article, gives a very good reason why the Divisional Forest Officers in the Central Provinces have been unable to make any working plans for their forests for he mentions the enormous areas in charge of each officer, is somewhat hard on the Department. He is also incorrect in one or two minor matters and as to working plans, simple plans of rotation of felling were drawn up and sanctioned in two large forests in my charge. Of other divisions I cannot speak but before I left the Provinces, I had prepared data for the working on the same system of another forest of sixty square miles. Still, I must admit that Tuscan’s strictures are merited to a certain degree, and that more might have been done in the way of simple plans which would have restricted the fellings to certain defined areas and to certain age classes and thereby prevented damage being done by indiscriminate cuttings uncontrolled and unlimited. But the part of Tuscan’s letter which I wish to notice is the last. Is it not possible to devise some scheme which, while controlling the exploitation of the Forests, will relieve the populace of the harassing rules in connection with the purchase and use of licenses, and the Department of the awful incubus of license accounts and at the same time, secure a revenue worthy of the enormous area in charge of the Department ; and this without reverting to that barbarous and, as all Central Provinces Forest Officers thought, by-gone system of commutation ?

I myself believe such is possible. That we will ever be able to do away with licenses in the Central Provinces I most deferentially beg to deny. The populace has to resort to the Reserved Forests for such a very large proportion of their forest wants and their transactions are each on such a small scale, that the license, objectionable as it may be in some person’s eyes—must be retained. But the present system of sale and accounts should be and can be abolished. Last year a system of adhesive stamps was proposed,—put into practical shape and—for some unknown reason to me,—put aside. This would have relieved the Department of an immense amount of account and facilitated the purchase of licenses to the public, but it was insufficient.

Briefly, my suggestions are, that the forests, those which it is intended shall be permanently maintained as such, be divided into two classes, one to supply large timber, the other small building wood and firewood. The first class would be worked under carefully prepared working plans which would have the creation of high timber in view, the second, on much simpler lines, laid down to secure a good growth of poles, the demand for which is enormous. This second class should be the one first taken in hand. The classification of the forests should not be a difficult matter. The forests of the Central Provinces are now nearly all well-known and the only point to be kept well in view would be, not to include in the first class any but those forests in which the growth of large timber is certain. Thus it might possibly happen that all the forests of a division would be in the second class.

Having classified the forests and fixed a cycle of rotation, the next point would be the control of the collection of revenue. In the first class of forests, as all cuttings would be most rigidly limited, this question would be easily answered; but the problem in the second class is not so easy, for we have to prevent fraud and yet allow access by the public to the forests with as little restriction as possible. I would fix the limits of the coupe, the age class of trees to be felled, or kinds of trees, the meaning of "firewood" and what may be felled as such, and then guard each coupe with a sufficient number of Forest posts located either on the edge of the forest or wherever most convenient. I would then issue tickets for sale at Treasuries, Police Stations or with private vendors who would have absolutely nothing to do with the executive staff of the Forest Department. These tickets would represent so much money and would be available for any produce whatsoever. The intending remover having purchased tickets representing the value of the produce he wishes to remove, would go into the open compartment or block, cut what he wanted and on his way out exchange his ticket for a small pass representing the quantity and kind of produce removed. These tickets would be available at any time, so that a man might purchase a lot when in funds and use them up as he wanted forest produce. The pass he would obtain in exchange would have everything printed, the only entry made on it at the time of exchanging it for a ticket being the date. It would be in duplicate and from the foils, accounts of the quantities and kinds of produce removed might be made up. The tickets would be equally available for grazing.

I think that this scheme would meet the wants of both parties. Working of the forests would be regulated and controlled, statistics of yield obtained, and the payment for and removal of produce subjected to a minimum of trouble. What say the Central Provinces Foresters to this?

7th November, 1892.

KODAGU.

Seeds of the Sugar Maple.

MY DEAR SIR :—

In the September number of the *Indian Forester* you request some subscriber to give you the name of a Canadian or American Seed dealer from whom you can obtain the seeds of the *Acer saccharinum*. It gives me pleasure to send you the name of the firm of Tho. Meehan & Son of Germantown, Philadelphia, Pa., from whom you can obtain the seed required. I am afraid, however, that it will be a matter of uncertainty as to its arriving in proper condition for germinating, as the seed must be planted as soon as ripe. However, it is worth the trial.

If we can at any time give you any information in regard to the trees or forest conditions of the United States, I trust you will not hesitate to call on us.

I am, Sir, &c.,

JOHN D. JONES,

Assistant Chief of Division.

U. S. DEPARTMENT OF AGRICULTURE,

Division of Forestry.

The flowering of Bamboos in Travancore.

SIR,

The following notes may be interesting :—*Bambusa arundinacea* flowered in South Travancore in 1816-17 according to Lieut. Ward, then engaged on a survey of the country. It flowered again over the same area in 1869-70. Throughout the northern half of the State this bamboo flowered in 1880-81.

Oxytenanthera Bourdillonii, the thornless hill-bamboo, flowered in 1888-89.

Teinostachyum Wightianum, a hill reed, flowered everywhere in 1887-88. It is said to flower only at very long intervals.

Ochlandra travancorica is said to flower every seven years. Different valleys flower at different times.

T. F. B.

III.—OFFICIAL PAPERS & INTELLIGENCE.

Rules for obtaining Photographic Records of selected Forest areas.

In order to illustrate the results attending the protection of forests from indiscriminate cutting, lopping, grazing, and especially from fire, as well as to indicate the progress of plantations or other réboisement works, it has been decided to start a system of photographic records for selected forest areas. Photographs of these areas will be taken periodically, and it is anticipated that the series of views thus obtained will be a most valuable aid in showing the results which may be and are obtained from forest protection. Forest officers are frequently met with the remark that in specified localities forest protection can yield no material or beneficial results; and occasionally the pendulum of official opinion and action swings backwards because no more convincing proofs of progress can be adduced than written records, often those of foresters who have retired, and evidence of this kind is not always accepted.

It is desirable, in order to obtain the best results, that, as a rule, photographs should be taken (1) of areas at the time they are first protected from fire or closed to grazing &c.; and (2) of areas which have been protected for some time, and which it is decided to throw open again to grazing, &c. To carry out this purpose, two cameras, together with all materials necessary for taking photographs in camp, will be supplied by Government, and the following rules are laid down for the use of the cameras and for guidance in taking photographs:—

1. One of the cameras will be under the charge of the Director of the Imperial Forest School, and the other under the charge of the Superintendent of Forest Surveys. Both cameras will be available for use in any part of the Bengal Presidency, and Conservators desirous of having a photograph taken of any special locality should apply in the first instance to the Inspector-General of Forests, stating the object of the proposed photographic record, as well as the name and the qualifications in photography of the officers whom it is proposed to entrust with the camera. The Inspector-General of Forests, if he approves of the

- application, will then arrange, either with the Director of the Forest School or with the Superintendent of Forest Surveys, for the supply of one of the cameras.
- II. The Director of the Forest School will determine, as regards the camera under his charge, what photographs should be taken for purposes of instruction at the School, and by which of the School officers the record will be made. If the camera is sent out with a party of the School students under the Deputy Director or an Instructor, the officer in charge of the party will, in communication with the local Divisional Forest Officer, select for operations such places as it may be considered desirable to photograph, reporting what he has done to the Director.
 - III. Similarly, the Superintendent of Forest Surveys will determine how, and by which of the officers serving under him the camera in his charge is to be employed.
 - IV. In order to ensure that for each locality of which a record is made, the same field of view may be obtained, the spot at which the camera was originally set up should be durably marked by a permanent benchmark, or, if this is impossible, by a record of the exact distance of the spot from each of two permanent bench-marks. For purposes of comparison, the camera should always be set up for each locality considered at the same height from the ground, and each successive photograph of the same series should embrace the same field of view.
 - V. The interval between the taking of two successive photographs of the same locality will ordinarily be five years ; otherwise the interval will be that recommended by the first operator and approved by the local Conservator. All successive photographs must be taken at the same season, and as nearly as can be on the same date.
 - VI. In order to better illustrate the rate of growth of vegetation, arrangements should be made either (a) for a graduated levelling staff, or pole with divisions and figures in feet clearly marked upon it, to be placed in a conspicuous position in the fore-ground on a previously constructed bench-mark, or on a site definitely fixed by angle and distance measurements from the camera bench-mark, so that it may be possible, with the aid of a magnifying glass, to read the figures on the photograph ; or (b) for a small group of the natives of the locality to be stationed at a similar place in the fore-ground, with a few others, if desired, scattered at various other points in the field of view.
 - VII. A register of particulars will be maintained by the Divisional Officer (copy being kept in the offices of the

Director of the Forest School and the Superintendent of Forest Surveys respectively), in which will be recorded in suitable columns—

- (a) the number of the negative and size of plate ;
- (b) the date and hour of the day ;
- (c) the position of the bench-mark or marks as required by Rule IV ;
- (d) the height of the camera-stand from the ground ;
- (e) the needle bearing of the edge of the camera ;
- (f) the position of the bench-mark of the measurement staff or of the group referred to in Rule VI ;
- (g) the general state of weather at the time, especially as regards cloud [the size of 'stop' used should be noted] ;
- (h) a short description of the locality and its vegetation ;
- (i) the special reasons for which the photographs were taken, with any additional information, such as the dates of closing of the tract to fire, grazing, &c. ;
- (j) the period recommended as best to be adopted between each two successive photographs ;
- (k) the name of the operator.

A special page or pages should be set apart for each view taken, so as to allow of easy comparison between successive entries. A copy of the entry should be deposited in the office of the Conservator of Forests of the Circle in which the place is situated, so as to provide against the possible loss of the register.

VIII. The negatives taken should all be numbered serially in agreement with the numbers given in the register, and should then be sent to the Photographic Office of the Survey of India Department, Calcutta, where they will be stored, and from whence prints will be obtainable on regular indents. A copy of each photograph taken should invariably be supplied by the Conservator, &c., as the case may be, to the undermentioned authorities :—

- (i) Inspector General of Forests.
- (ii) Director of the Forest School.
- (iii) Superintendent of Forest Surveys.
- (iv) Conservator of the Province or Circle.
- (v) Divisional Forest Officer.

IX. When the cameras are used for private purposes, such as photographing camps or other views not necessary for the requirements of the Forest Department, Government plates and other materials must not be used for negatives or for the printing of photographs.

Review of Forest Administration in British India,

FOR 1890-91.

BY THE INSPECTOR GENERAL OF FORESTS.

This publication has come so late that we hardly think it necessary to review it. But as there are many statements of the greatest interest, we prefer to select from these for the information of our readers and especially of those at a distance.

(1) IMPORTANCE OF BRINGING ALL FOREST AND WASTE LANDS UNDER THE ACTS.

"In several provinces extensive tracts of waste lands still exist, which, though they belong to the State, have not as yet been brought under the control of the Forest Department, or under any other systematic control. There are no means at the disposal of the Local Governments by which a conservative management of such lands can be secured as effectively and with such perfect justice to all parties interested as by reservation under the Forest Act, and the reason why this course has not been more widely followed lies presumably in the fact that all State lands finally settled under the Forest Law are denominated "Reserved Forest," and in the belief which arose, as a natural consequence of this name, that the Local Governments would utilize such areas only for purposes of Forestry. This, however, is not the case, and it rests with local authorities to use their settled State lands in any way they may consider most advantageous to the general welfare of the people and to the revenues of the State, so long as such use does not interfere with vested rights on the one hand, or the proper maintenance of the forests on the other. In order to enable them to gauge with greater certainty the advantages of a wider application of the procedure for the settlement and reservation of State lands, the Government of India have issued, during the present year, an important *Circular, No. 17—105 (Agri.), dated 15th July, 1891*, asking Local Governments to analyze the State lands district by district, and to classify them in accordance with main purposes which they should serve, and for which they should be systematically treated.

"There is no doubt that under the idea that Reserved Forests were intended merely for the growth of timber and fuel, only such areas were as a rule selected and reserved as either answered that purpose or were considered necessary for the protection of hill-sides and the underlying cultivation dependent on such protection. Nevertheless, it is quite possible that areas were included, especially during the earlier period of reservation, which are fit for permanent and selfsupporting cultivation, such as would require no support in the shape of forest rights or other concessions over land outside the limits of the cultivated area. Under

‘these circumstances, provided the forests are sufficiently extensive to meet the demands made on them for forest produce, and are not required for protective purposes, there is no reason why such lands should not be let out for cultivation, or be even alienated; for it is in the interest of the State revenues and the forest administration to develop and increase the local markets for the consumption of forest produce. The importance and value of fodder reserves created for that purpose are largely increased by their proximity to cultivated areas. Such supply not only a market for the produce of the reserve but the labour necessary for the cutting and gathering of the crop. Every forest area, closed against grazing, may be used as a fodder reserve as soon as the young tree growth has sufficiently advanced in size to escape being cut with the fodder grasses. Areas should only be classed as *boni fide* pastures, which either bear no forest growth for climatic reasons, or the protection or afforestation of which is of no consequence to the surrounding country. In connection with the pastoral requirements of agricultural communities, two facts must always be kept in view, the first being that such requirements can to a great extent be met from State lands, even under a silvicultural treatment, by keeping open to grazing a certain portion, varying according to circumstances between 30 to 60 per cent; the second, that with the advance in agriculture, and consequent increase in the culture of fodder crops which occurs in every peaceful and well administered country, the demands on pastoral lands and forest-grazing diminish.’

(2). WORKING PLANS AND IMPROVEMENT FELLINGS.

‘It is under present circumstances undesirable that the more or less stereotyped pattern of working-plan of continental Europe, especially that of Germany, which has developed to a great extent simultaneously with a system of equi-aged crops, should be grafted on our Indian Forest Administration, as we have in this country almost invariably to deal with forests in which the age-classes are intermixed, and which, consequently, require a more natural and less constrained treatment.

‘No doubt a very large proportion of our Indian forests are in the same condition, and frequently in a worse state than that which, in the latter half of the last century, led, on the Continent, principally in Germany, to the more or less general adoption of the treatment under equi-aged crops. The former have been in most instances ruined by centuries of mismanagement and are even now subjected to extensive—frequently excessive—grazing; and this makes it doubtless necessary that the reproduction and young growth should, as far as practicable, be concentrated within defined areas in order to render their protection and proper treatment feasible.

‘To a great extent, however, this purpose can be arrived at by a mere localization of the exploitation of the forest and by a rota-

'tion of fellings, and, consequently, by a treatment based purely 'on area and the sylvicultural requirements of each component part 'of the forests. In the great majority of the Indian forests, especially in regard to those which have been subjected to fires, over-grazing or periodical cultivation, the most suitable sylvicultural treatment consists without doubt in improvement fellings, more or less severe as demanded by the local conditions of climate, position, soil, and the character of the existing forest.' It goes 'without saying that the areas thus treated must be closed strictly 'against grazing for a period sufficiently long to admit of the young 'growth outgrowing all possibility of damage from this cause, and 'it is this consideration which to a great extent must affect the 'length of the period of the return of the fellings to the same locality. The greater the area of a forest which can be entirely closed 'to grazing and which can be successfully fire-protected, the more 'rapid may be this return, and within certain limits, dictated by the 'opening out of the canopy, necessary for the exposure of soil and 'the admission of light required to ensure reproduction and to favour young growth, the more rational can be the treatment."

(3). THE LATE MR. D'ARCY'S NOTICE ON THE PREPARATION OF WORKING PLANS.

"This review of the progress made in the preparation of working-plans cannot be more fittingly closed than by noting, in grateful remembrance, the services rendered in this branch of forest administration by the late Mr. D'Arcy, both as Assistant Inspector-General of Forests in the ordinary course of his work and by the publication of his valuable little book "Notes on the Preparation of Working-Plans."

(4). GRAZING.

"Grazing, as has been frequently stated, is doubtless the most wasteful manner in which a fodder-crop can be reaped, and as agriculture advances its importance falls more into the background. Moreover, grazing in the forests to be maintained undisturbed tree-growth has the further disadvantage that by it the development of young growth is either destroyed or impeded. The present agricultural development, however, of the greater portion of the Indian Empire is not sufficiently advanced to permit anything else than a gradual restriction of the previous custom, under which the herds, unrestricted as regards numbers or seasons, roamed over the whole of the unoccupied areas."

"Lands which, for one or other of the various reasons which demand such a course, it is desirable to maintain or place under forest growth, doubtless require a different treatment from those which can, without prejudice, be utilized *prima facie* as pasture lands; for as regards the former it is imperative that a considerable portion should be closed periodically for a time of sufficient length to allow of the establishment of reproduction and its growth beyond the reach of danger from cattle; whereas, in the case of

‘the latter, it will suffice to close the areas for the period during which grass is growing. In either case it is necessary for a rational treatment that the number of cattle admitted and the period of such admission should be further restricted in proportion to the possible fodder-yield of each area.

‘In whatever category the waste land belonging to the State may be classed in accordance with the policy promulgated by the Government of India, it is necessary that endeavours should be made, as far as circumstances permit, to ensure eventually its systematic treatment. This may, especially as regards areas subject to grazing, not always be possible in the immediate future. Similarity, for example, may be inevitable, at the outset, in grazing regulations. But in such a case it is important that the regulations should be provisional in character, and capable of amendment to suit altered conditions and requirements. Great caution should, in particular, be exercised in the grant over reserved forests of grazing privileges, either free, or at rates differentiated in favour of agricultural cattle or of cattle belonging to villages adjoining forests. Besides the injury to revenue resulting from the grant of such privileges, administrative embarrassment may be caused when it is considered desirable to withdraw them. Difficulty has also been found in distinguishing between privileged and other cattle. This difficulty, however, might to a great extent be met by demanding in the first instance the same fee from all cattle except those of *bonâ fide* right-holders, and by refunding the same or part thereof through the revenue administration to such persons as the Government may declare to be privileged.”

(5). NATURAL REPRODUCTION AND THE MEANS OF ASSISTING IT.

“It may be accepted that the success or failure of natural reproduction depends, in proportion with the dryness of the climate, on successful protection from fire and grazing and from the removal of vegetable mould or of the leaves which form this mould by their decomposition. To prevent fires and to prohibit or regulate grazing and the removal of mould as far as is compatible with other circumstances, is consequently one of the most important duties of a forest administration. It is not, however, merely forest reproduction that the Indian forester has to secure, but the right kind of reproduction; and this is a problem which presents frequently the greatest difficulties, and is, under existing circumstances, sometimes unattainable. Much can, however, be done in directing the course of the process of reproduction into the desired lines by felling or girdling round trees of the species it is intended to foster with a view to establishing groups of advance-growth of the more valuable kinds.

‘Such girdling should take place even around younger trees of the favoured species, in order to allow of their maturing at an earlier age than would otherwise be the case.”

(6). ANALYSIS OF FINANCIAL RESULTS.

The table below contains an analysis of the Revenue and Expenditure :—

		Rs.		
Gross Receipts.	(a) Wood	...	1,11,78,510	
	(b) Minor forest produce	...	15,03,187	
	(c) Grazing	...	17,35,157	
	(d) Revenue from forests not managed by Government,	...	2,63,014	
	(e) Miscellaneous	...	2,87,267	
Total		...	1,49,67,135	
		Proportion of Expenditure to Gross Receipts.		
		Rs.	Per cent.	
Expenditure.	A.—Recurring.	(i) Superior staff	17,42,055	11.64
		(ii) Subordinate staff (including Rangers, Foresters, and Forest Guards)	12,19,874	8.15
		(iii) Cost of Offices (including contingencies)	5,89,199	3.94
		(i) Cost of extraction	25,97,082	17.35
		(ii) Roads and Buildings	2,89,308	1.93
		(iii) Fire protection	2,07,922	1.39
		(iv) Cultural operations	2,90,198	1.93
		(v) Live-stock, stores and plant	1,99,328	1.33
	B.—Extraordinary.	(vi) Working Plans	60,604	.41
		(vii) Rent of leased forests	1,11,465	.74
		(viii) Miscellaneous	1,30,202	.87
		(c) Expenditure on realization of revenue from forests not managed by Government	8,825	.06
		(d) Forest Science and Education (including all "A" and "B" charges, Forest School)	63,173	.33
		Total	75,09,226	50.17
		(e) Forest Settlements (including compensation)	36,037	.24
		(f) Forest Surveys	3,97,762	2.66
		(g) Forest Demarcation	1,20,100	.80
		Total	5,53,899	3.70
Grand Total Expenditure		...	80,63,125	
Net Revenue		...	69,04,010	
			100.00	

IV.—REVIEWS

Reports on the Horticultural Gardens

AT LAHORE, SAHARUNPORE, LUCKNOW, AND IN THE NILGIRIES,
FOR 1891-92.

There is not much to be said about the Agri-Horticultural gardens at Lahore. The income was Rs. 13,973 and the expenditure Rs. 22,603, the former chiefly derived from the sale of garden produce, and the latter due to establishment, purchase of plants and seeds, manure and miscellaneous items. The year was unfavourable generally, but grapes, figs and peaches did well. Queensland peaches yield a heavy crop of fruit with excellent flavour. Agricultural experiments yielded nothing of special interest, and the gûr manufactured from acclimatised seed of *Sorghum saccharatum* was not a success.

The report of the gardens at Saharunpore and Mussoorie, under the management of Mr. Gollan is more interesting. A large number of successful experiments in the growing and distribution of various useful and ornamental plants are being made; among fruits, we find the American dewberry, the Arabian date palm, the Avocado pear, Japanese figs, several kinds of oranges from Florida, two peaches also from Florida one of which is a valuable late kind, plums, persimmon, the star apple, all doing well, whereas there were only a few failures among vines, guava raised from imported seed, and Japanese loquats. Among vegetables, the most important experiment was the introduction of 22 varieties of potatoes from the well-known seedsmen, Sutton and Sons, of Reading. The best kind proved to be Windsor Castle, which yielded very large tubers of excellent quality and quite free from disease. Then in order Early Border, Magnum Bonum, Early Regent, Satisfaction, Masterpiece, and Early Eclipse. In the orders of Government it is said that extracts from the reports should be circulated to potato growers in the hills; many of these men, however, are natives who cannot speak English, and it would be necessary to get these remarks translated into Hindustani for their benefit—this would form a capital exercise for the next examination of the Forest Officers for the Higher Standard, and we offer this suggestion to the authorities for what it is worth.

A new fodder plant, *Lathyrus sylvestris*, did not come up to the expectations formed of it by reading the praise given it, in

European Journals on horticulture. It might do better in a more temperate climate.

The following remarks in sugar cane will be read with interest :—

“Sugarcane (*Saccharum officinarum*).—In the last annual report, I noted that a sowing of sugarcane seeds had germinated, but sometime after submission of the report in question, I regret to say the supposed sugarcane seedlings turned out to belong to various species of wild grasses, or, in other words, proved to be weeds. The reported success of last season in raising sugarcane from seed was therefore in reality a failure. I was led astray by seeing the husks of sugarcane seeds adhering to the cotyledons or seed leaves of some of the grasses which appeared in the seed pans; but afterwards it was of course found these had been merely picked up by the seedling weeds as they emerged from the soil. During the past cold season two varieties of sugarcane flowered profusely in some parts of the district of Saharanpore. In the lands in the immediate vicinity of the city, only a few stray flowers were to be met with, but in the northern part of the district or close under the Siwalik range of hills nearly every plant flowered in some fields. Seed for further experiment has therefore been plentiful; but owing to the mistake of last year, I shall exercise more care before passing an opinion. Several sowings of the seeds obtained locally have been made since the commencement of March in pots in beds made under glass frames, and in beds made in the open ground. In all cases an abundant crop of grass seedlings has appeared, but so far, I have not with certainty been able to identify any of the grasses which have appeared as being the seedling of the sugarcane. In addition to the seeds obtained locally, a large parcel of Assam sugarcane seed was received from the Director of Land Records and Agriculture, North-Western Provinces and Oudh, and two small packets, from the Deputy Commissioner of Betul. These have been sown under the same conditions of treatment as given to the local kinds, but the remarks made in the preceding paragraph regarding the condition of the latter, also apply to the present condition of these Assam and Betul varieties. At present, I am of opinion that none of the sugarcane seeds sown during the past few months have germinated; but as I still have a considerable quantity of seed on hand, renewed attempts will be made to germinate it on the advent of the rains.”

Attention was given to arboriculture and the District Board supplied with 1630 trees for avenue purposes, but several thousands more could have been supplied of necessity. In a climate like that of the Saharanpore district, there is no reason why every road should not have its avenue.

The leaves of Eucalyptus trees were supplied to railways for cleansing the boilers of locomotives, and 103 maunds were thus utilized at a price of Rs. 2 per maund. This appears to be an industry that is capable of extension.

Numerous applications are made every year for trained gardeners, and Mr. Gollan has a class of 24 boys under training for this purpose ; they are sent out on salaries ranging from Rs. 12 to Rs. 25 a month.

The chief function of the Mussoorie garden is to render assistance to the parent institution down below. The main items of interest were the successful cultivation of the giant chestnut of Japan, the tree tomato and Jalap. The tree tomato is well worthy of notice ; it is a plant that is of easy culture, rapid growth, and comes into full bearing at three years from seed. It is perfectly hardy up to 6,000 feet and the fruit begins to ripen about the middle of summer, continues to yield a succession of fruit until midwinter, and can be eaten raw or stewed, with a pleasant sub-acid flavour.

Taking into consideration the value of plants and seeds issued to soldier's gardens and to public gardens in India and other countries either free, or at reduced rates, the Saharanpore gardens are practically self supporting.

At Lucknow, the season, as in other parts of Northern India, was unfavourable for gardening operations, and the high flood of the Goomti in October 1891 submerged the arboretum for over a week, with the result that nearly all the young trees died. Serious loss to fruit trees and cuttings of ornamental shrubs also ensued. Various experiments were tried in these gardens, some of them confirming the results obtained at Saharanpore. The paper mulberry cultivation proved expensive and unprofitable ; the local paper mills gave eight annas a maund for the bark, and intimated that they could not in future take any more. Considerable attention is given at Lucknow to the cultivation of various kind of *Eucalyptus*, especially *E. citriodora*. Trenching the ground has been found to keep off white ants, but a disease has made its appearance in the bark, several trees losing their leaders from this cause.

The report for the Government gardens and parks, Nilgiris, is written by Mr. Lawson. One of the experimental gardens was visited by a severe storm which destroyed several precious fruit trees but the Durian escaped and for the first time bore fruit. Under the head of economic plants, we notice the attempt to introduce a fluid extract from the blue gum for cleansing boilers, but the reports received concerning it are contradictory. *Eucalyptus* oil is made on a large scale by a Mr. Wallace and this appears to be of excellent quality. *Ipecacuanha* is being tried and Jalap produces better in the Nilgiris than the plant grown in Mussoorie. The scrub exterminator, which is now being advertised in the papers, is mentioned as a dangerous poison, highly noxious to cattle grazing in places where it is used.

These gardens and parks are not kept up as a paying concern, and the expenditure largely exceeds the revenue.

Indian Gardening.

The appearance of another book on Indian Gardening is an encouraging sign of the times, as indicating an increasing demand for the most recent information regarding the cultivation of English vegetables and flowers in this country. This new book by Mr. Barton West has much to recommend it. It is well arranged, and the illustrations, though many of them savour of the nurseryman's catalogue, cannot fail to make the subject attractive. The book is divided into five parts. Part I, consisting of ten chapters, tells in how to lay out a garden, and is full of sound and practical advice as to the preparation of the soil, the making of lawns and roads, and other necessary operations. In chapter 10 will be found an excellent account of insect pests with directions for their prevention or extermination. Part II takes up the kitchen garden, and gives an alphabetical list, with descriptions, of all the different kinds of vegetables and herbs which may be grown in the plains and on the hills. A similar list of annual and perennial flowering plants finds a place in Part III. Another part is devoted to bulbous plants, and the concluding part gives instructions in cultural operations for every month, for the hills as well as for the plains. This book will be found especially useful for Upper India, but might be consulted with advantage by amateurs in other parts of India with certain adaptations to suit the differences in climate. Two more chapters, the one on Roses and their cultivation, and another on the treatment of fruit trees and Strawberry beds, would have added much to the value of the book.

Practical Gardening for Indian Amateurs, by R. Barton West. Publishers—The Mafasilite Printing Works Company Limited, Mussorie, 1892. p. p. 379, with numerous illustrations.

Arboriculture in Berar.

The report of the Conservator on arboricultural operations during 1891-92 shews that very little work has been done by District Boards; there is practically no increase in the number of trees under their care. Each district has its working plan, but more attention should be paid to nurseries—only 2,582 plants were supplied, a very large falling off from the previous year. The P. W. D. however appear to have done better, as they sowed and planted 75 miles of avenue and maintained 59 nurseries at a total cost of Rs. 23,000. We doubt the advisability of sowing in situ for avenue purposes; it is far more satisfactory to raise the plants in a nursery,—in bamboo baskets is a very good method—and plant in pits with good soil. It is cheaper in the end, and the desired result is obtained sooner. The Commissioner of the H. A. D. promises to look into the matter of arboriculture and we shall hope for greater success next year. The whole question of planting new avenues and maintaining existing ones along roads in India is one of the utmost importance for the country.

V.—SHIKAR.

A New Experience.

The forests we set out to visit in November were remarkable for two reasons, firstly for the prevalence of jungle fever and secondly for the presence of Wild Buffalo. Fact number one did not interest or surprise us, whereas fact number two filled our breasts with much longing and a little hope, and we started armed to the teeth, with quinine for the fever and with a heavy D. B. '577 express for the buffalo. After days of wandering, during which we were sometimes cheered by the sight of buffalo tracks, sometimes depressed by the paucity of game of any kind, and always regaled by the ready native with wonderful tales of what had happened in years gone by, how the Collector Sahib had fled for his life from a wounded Cow; how the Assistant Engineer had been treed by a furious bull; and how the Opium Wala had been floored by an outraged calf; we arrived somewhat weary and yet full of ardour, on the borders of Nipal and pitched our camp in an open plain dreary enough in itself but rendered beautiful by the magnificent view of the snowy ranges which filled in the northern horizon. We had given up all hopes of buffalo, a chital stag would have satisfied us, we were even keen on the domestic antelope; so much so that seeing several bucks not far from the tents, we started in the evening to stalk one if possible. The better half of us remained on the pad elephant to watch the sport from a distance and was rejoined later on when a buck had been missed and the calling of chital and the rumbling roar of a leopard recalled us to the possibility of better sport in the neighbouring Sal Forests. The sun was already setting when we entered a narrow grassy glade and stole quietly along amidst the lengthening evening shadows, disturbing, as we went, a couple of hinds and one small stag not fit to shoot. We were tired after a long rough march, prolonged by losing our way and having to walk miles through rough tree jungle; and the calm coolness of the autumn evening was fully appreciated as we indolently sat on the pad elephant. Suddenly, it seemed as if out of the ground, arose a mighty form which in two lazy bounds reached the edge of the forest and turning, faced us with lowered head and ready horns. And the heavy rifle was miles away in Camp! The utter futility of attempting to stop that bull with a hollow fronted bullet was our first thought; the second whether he would charge and scatter us to the winds if we annoyed him; the third, that if we let pass this chance of bagging a solitary bull

we should never in all our lives have another ! We moved the elephant so as to have something softer than a forehead to aim at but the huge head turning slowly so as to keep a front to the enemy, we steadied the rifle for a second and pressed the trigger ! The smoke rolled slowly down the little glade and as it lifted we saw the buffalo lying dead where he had stood menacingly one instant before. Approaching cautiously, we needlessly expended a couple more cartridges without producing the slightest effect and then surveyed our prize. The first bullet had struck in the centre of the forehead and exploded in the brain. He was a full grown bull in the prime of life ; so far, our knowledge of buffaloes informed us ; but whether exceptionally large we could not tell. At any rate, he was over 11 feet long from the nose to the tip of the tail, and his horns measured 8 feet 4 inches from tip to tip along the outside curve and across the forehead. He was big enough for us, we wanted him no larger ! That night, a noisy procession crossed the level plain under the light of the young moon and through the evening mists. It was preceded by a hurricane lantern, and twenty willing pairs of arms urged the timid oxen to draw the cart heavily laden with the lone monarch of the jungles who fears no foe save man and does not hesitate to make it unpleasant even for him when vexed. Pathos is impossible when one of the last representatives of the virgin forest is lighted to his grave with oil from Batoun and a lantern from America ! But the rifle which had slain him was examined by indigenous experts and pronounced to be hard hitting and when the ever ready sycophant opined that the " sahib's " power was such that one bullet sufficed to kill an elephant, he was silenced by the remark, greeted with much applause, that the bull had died of the shock and surprise of being " Shikared " by the " Mem Sahib."

O. C.

Notes on the Otter.

In these days of fish preservation societies, when much trouble is taken by individuals to improve the sport in certain Indian waters, attention may well be directed to the injury done to the fishing by otters and the means available for diminishing the numbers of these pests. Being a keen fisherman myself, I have, how often, been grieved and infuriated to find, on arrival at well-known pools and reaches, that the fish have been either cleared out altogether or scared away, whilst the numerous tracks on the sandy banks and the remains of many good fish lying about, explained what had been taking place during the previous night. The presence of a few otters on a long stretch of water is bad enough, but when it comes to schools of ten or twelve hunting in line, either the

otters must be removed or fishing must cease. In the *Forst und Jagd Zeitung* for October there are some interesting notes on the difficulties caused in the waters of the Fishing Society on the Neckar at Tübingen. The attempt to introduce new and better varieties of fish into these waters was completely frustrated by the otters, who shewed a marked predilection for new and superior feeding ; and the members of the Society were driven to despair until a Godsend, in the shape of a young man with a knowledge of traps, arrived on the scene, who in the course of some six months on some four miles of water, put an end to twelve otters, one badger and a fox. The Fishing Society at Tübingen is now once more happy, having completely circumvented their foes and desire to aid other societies in similar circumstances. It has been calculated that the annual feed of one otter amounts yearly to three-hundred to five hundred pounds of fish, besides what the brute wastes, which would amount to as much more. That this is a moderate estimate, is proved by the fact that a twelve lb. otter caught at Tübingen contained four lbs. of fish : the largest capture, weighing 21 lbs., would probably have taken six to seven lbs. of fish at a meal ! With regard to exterminating otters, shooting has been found to be quite useless ; poisoning is impossible, as the otter will not touch dead fish ; but success attends the laying of spring traps in the run just at the water's edge but not in the water. The Indian otter is more migratory than the European animal but still there are times and places where a stay of some days is made, and it seems to me that it would be quite possible to train a native to skilfully lay traps in the stretch of water in his charge, and that a liberal payment per head would soon result in a considerable diminution of these pests. The trap used by the Tübingen Society is labelled 126 in the Catalogue of Messrs. F. Grell and Company at Heynau, Germany. From another quarter, in the same periodical, comes a story of the utility of the otter, which must tend to discourage the ardent fisherman. Mr. Oberförster Haug having procured two otter cubs of a few hours old, still with unopened eyes, and wishing to send them to the Stuttgart museum, proceeded to drown the poor wretches and after seven minutes immersion in water, packed them up tightly in newspaper and despatched them by parcel post. He received some days after a letter from the Curator saying that only one had arrived safely, the other having been killed when stamping the parcel ; the survivor at once took to a bottle and was thriving vigorously when he wrote !

VI.—EXTRACTS, NOTES AND QUERIES.

Parliament House Mimosa, Cape Town.

Mr. D. Hutchins, Conservator of Forests, has made the following report upon the age of the old mimosa tree which was recently blown down in the Parliament House grounds, and to which reference was made at the time in these columns :—

Two transverse sections were sawn off as low down as the decayed state of the trunk would allow, which was about five feet from the ground. Below this were the remains of a large rotten branch that had communicated decay to all below it. The lower part of the trunk was so decayed that the tree must soon have fallen whether the late gale had spared it or not. The mean diameter of the trunk at five feet from the ground was 1 foot 6½ inches ; there was no regular bole above this. The tree has been cut up so as to afford as much straight wood as possible ; from the branch pieces and out of a piece of the trunk above the first branch, some short planks, one inch thick, have been cut, and are being carefully seasoned.

At first, I thought it would not be possible to arrive at any estimate of the age of the tree from the zones of growth, which are irregular and clearly not annual. This very commonly happens with trees that are natives of mild, equable climates. Very few of the indigenous trees of South Africa show distinct and regular zones of growth, and in the case even of these few we have no certainty that the rings appearing on the transverse section are always annual. This, as is well known, is different from the case of trees that are natives of the northern hemisphere, where the sharply contrasted seasons of summer and winter are clearly traced in the yearly rings of growth. The naturalised oaks and pines have preserved their original habits of growth, and show distinct annual rings here. I was the more disappointed at not finding yearly zones on the Parliament House Mimosa because the *Acacia horrida* is closely allied to the *Acacia arabica* of Asia, about which Sir D. Brandis writes :—

“ Pores numerous, uniformly distributed, generally surrounded by a small rounded patch of lighter-coloured tissue, often close together in the inner belt of each annual ring, the outer belt having fewer pores, and appearing on that account of a darker colour.”

However, before giving the subject up, I thought I would count the lines of pores, which, over the greater portion of the radius, are quite distinct. A preliminary counting gave 573 lines of pores. This divided by 2 gives 286 years, which is about the historical age of the tree. Mr. Noble was in my office at the time, and I gave him this as a preliminary result.

I was not able till yesterday to take the matter up again. Four different countings, of which two were taken along the same radius, gave the following results, the difficult portions in each radius being more than once verified.

1st counting	(light bad, 6/9/92)	...	...	604
2nd	„ (light good, 14/9/92)	...	...	630
3rd	„ „ 15/9/92)	...	...	626
4th	„ „ „	...	...	615

The second and third of these countings were along the same radius. I consider that the most correct result will be obtained by taking the mean of the last three countings, *i.e.*, 624.

I take it that each line of pores represents the spring and autumn growth.

	Years.
Dividing 624 by 2 we obtain	312
Add 8 years for the growth from seed to 5 feet high	8
Total age of tree	320

This, I think, is as near a result as can be attained. In some places lignification and incipient decay render the lines of pores indistinct. In any case, this method is far from having the precision that attaches to counting the yearly rings, as it proceeds on the assumption that a line of pores represents the spring and the autumn spurts of growth. Numerous observations, however, in the forests and outside, make it certain that in South Africa, spring and autumn are the two periods of activity in tree growth.

The growth of the Parliament House tree is slowest in the first and last half centuries of its life. Slow periods of growth are observable at the 40, 46, 89, and 260th years. That at eighty-nine would be nine years after the arrival of Van Riebeck and his settlers, and this slow period may be connected with the clearing or draining operations of those days.—(*Cape Times*).

Important tests of Australian woods.

The following important tests of Australian and other woods may be found useful to many of our readers. They were made in the presence of Mr. Thomas Laslett, timber inspector to the Admiralty, and have appeared in the *Shipping World*.

TRANSVERSE EXPERIMENTS.

Name of Wood.	Weight per Cubic Foot.	Specific Gravity.	Transverse Strength per Square Inch.	Average Tensile Experiments.				Number of Years Assigned by English Lloyd's for Shipbuilding Purposes.
				Dimensions of Each Piece.	Weight the Piece broke with.	Direct Cohesion on One Square Inch.	Vertical or Crushing Strain on Cubes of 2 in.	
	Lb.		Value of s.	In :	Lb. per sq. in.	Lb. per sq. in.	Tons. per sq. in.	Years.
Indian teak ...	49.47	807	2203	2-2 x 30	13,207	3301	2.838	14
English oak ...	58	886	2117	2-2 x 30	30,287	7571	3.411	9
Jarrah ...	63.12	1000	1800	2-2 x 30	11,760	2940	3.198	12
Karri ...	61.31	981	2264	2 x 2 x 30	28,280	7070	5.146	12

(Timber Trades Journal.)

White-ants and Mango Trees.

If the bark of the trees is attacked by white ants, it must be first scraped off at all parts where the animals have made tunnels, and painted with kerosine. Let the ground be dug between the trees as deeply as necessary, the soil turned over and watered with phenyl, if procurable; if not, with kerosene and water. In Ceylon, a decoction of the leaves of Mauritius hemp is used for expelling white-ants, but I fear, a correspondent writes, you have got into too bad a state for that to be efficacious. It has the advantage of being, of course, quite harmless to any trees. In using the phenyl, put some in a pail and add water till it is of the colour and consistency of good milk. Every plantation should keep phenyl. It is perfectly safe with foliage; carbolic acid and kerosene are not. It is exceedingly good for mealy bug. Corrosive sublimate and Paris green will both destroy white ants; dissolve in water and pour into the holes. But be careful not to poison the trees by putting these poisons too close to the roots. Corrosive sublimate is very popular here, being used dry. The planters have told me that one white-ant eats a grain, dies, and is eaten in turn by another who dies and so on till the nest is exterminated. I cannot quite credit this, but the poison has a very strong effect on white-ants. Of course care should be taken in dealing with corrosive sublimate in bulk, as it is an exceedingly dangerous poison. After you have well poisoned the white-ants, remember to manure the

trees well, so that they can have strength to recover. If it is possible to flood the plantation for a few days, the ants would have to retire, but this is rarely possible here at least. I do not think it would hurt the trees, as I have here splendid old trees growing in water. I should like to know the results of these suggestions should you find time to inform me, as I am collecting together all kinds of notes on destructive insects and methods of destruction.—
(*Indian Agriculturist*.)

Bulgarian Forestry.

At the National Bulgarian Exhibition at Philippopolis there is a pavilion of forestry, tastefully constructed of logwood, and containing various specimens of woodwork and blocks cut from the stems of the enormous trees which still flourish in the remote primeval woodlands of Rhodope and the Balkans. This is a reminder of the ruthless destruction of Bulgarian forests which went on in Turkish time, and still continues to some extent notwithstanding the efforts of the Bulgarian Government to check it. An interesting feature in this pavilion is a portion of one of the wooden tramways which are used for bringing timber down the steep sides of the mountains. The stems of young trees supply the place of rails; the felled timber is laid on wooden trollies with small wooden wheels, and descends the mountain at a rapid pace in charge of two or three men, who find a precarious standing place on a peg which projects over the wheels, and check the pace by working a brake with the foot.—(*Timber Trades Journal*.)

The teak trade of Chiengmai.

The Trade Report for 1891 of this important dependency of Siam, by Mr. Stringer, British Acting Vice-Consul at Chiengmai, should be of considerable interest to the local Government, says the *Rangoon Times*, which has secured an advance copy of it. Much is not known of Chiengmai in Burma, and Moulmein is the only town which has any trade relations with the Laos States, excepting the semi-independent Shan States under British protection, so the report we propose to shortly review here, contains information interesting as well to the general public as to those connected with trade and commerce in Burma. This is the second report of its kind which has been issued, we believe, the first report being for the year 1890.

At present Chiengmai is what may be called a timber country. Its teak is its chief, almost its only, source of wealth, and it is pity to know, as the writer of the report tells us, that the teak forests are being fast ruined by the neglect of the rules of forestry by those

who are working them, with the consequence that teak is becoming scarce in Chiengmai and Lakhon, forests which have for years supplied Bangkok and Moulmein with the high class timber for which the latter port has become famous. We do not understand how there can be such a total absence of conservancy in the forest when the timber trade with Bangkok is chiefly in the hands of British firms, and when the Chiengmai forests on the Salween side are worked almost entirely with British Indian capital brought from Moulmein. One would imagine that intelligent merchants or traders, whether European or Indian, who have such a profitable trade in their hands, would not by neglecting the ordinary rules of forestry and depleting the forests, kill the goose with the golden egg. We could quite understand the Laotians ruining the forests through pure ignorance of forestry. However, the European and Indian Foresters (and the Bombay Burma Trading Corporation is among them) have a great deal of obstacles to content with. Teak saplings, it appears, are cut down in large numbers by the people for use for building purpose and for fences, and although the lessees of the forests are nominally protected against such destructive poaching on their concessions, no steps seem to be taken practically to check it. The forests are leased for only three years, which not only often causes considerable loss to the foresters, but makes them indifferent to the causes which are at work in depleting the forests of teak. It is clear that, unless the foresters strongly represent to the Siamese authorities the necessity of introducing strict forest rules and regulations, and seeing that they are not contravened, the forests will soon become depleted of their teak. We know that it is a very difficult matter for European traders in Oriental countries to influence the local officials even in matters in which the good of the country is involved, but we think that, considering the large gain which it will be to foresters obtaining favourable leases of the Chiengmai forests, the European foresters might, in their own interests, do their best to get the administration of forests placed on a better footing. We have dwelt on this question, because we are of opinion that what benefits Chiengmai is good for Burma in more ways than one. The connection between the dependency of Siam and Burma is one which is cemented and rendered important by the timber trade of Moulmein.

Chiengmai finds an outlet for its timber trade through Bangkok and Moulmein. The average annual quantity of teak which is floated down the Me Ping, Me Wang, and the Me Yom to Bangkok is about the same as reaches Moulmein by the Salween. However, during the year 1891 the quantity which arrived at Bangkok was abnormally small and far below the quantity which reached Moulmein, although the latter port got 18,244 logs more during the previous year. It is expected that the delivery in the coming season of logs at Bangkok will be much larger, as there will be considerably more water in the rivers than there was during 1891. The timber trade of Bangkok is also chiefly in the hands

of British traders, but as far as we can judge, those connected with the timber trade seem more eager to develop the trade with Bangkok than with Moulmein. During the coming season, it is proposed, as an experiment, to send squared logs instead of logs in the rough, as is being done now, from Chiengmai to Bangkok, as less duty will have to be paid, and the weight to be dragged through the water will be less. Before the logs, intended for delivery at Bangkok, arrive at Chainat, the duty-station on the Menam, they are brought down several branches of the main river, chief of which are the Me Wang, and the Me Yom which we have mentioned. During 1891 these rivers bore 9,500 logs down to the duty-station, against 30,000 the previous year, and upwards of 60,000 during each of the years 1888 and 1889. It is expected that during the coming season, with ordinarily good waters, the delivery from the Me Wang and Me Ping alone will be 30,000 logs, and which high floods 50,000 logs. During 1891, the *Salween* brought 13,873 logs down to Moulmein which was 18,244 logs less than during the previous year. The scarcity of water in the rivers, the result of the scarcity of rice from drought, which appears to have been as acute in Chiengmai as it was in parts of Upper Burma, contributed towards the depression of the teak trade during 1891.

The statistics collected by the British Acting Vice-Consul, considering the informal way in which Siamese officials do things, cannot be expected to be scrupulously correct, but they are correct enough to give one a fair idea of the conditions of this trade. With what facts we have before us, it appears quite certain that if a very material alteration in the forest administration of the forest areas of Chiengmai is not made soon, the teak trade of this province will, in a very few years, be a thing of the past, with the consequent result that Chiengmai will be greatly impoverished and become denuded of many of its inhabitants, who will have to seek occupation in the surrounding districts. The chief source of wealth of the Laos States is their teak, and when the forests become depleted of their teak, the result we have stated must follow.—(*Timber Trades Journal*.)

Podophyllum Emodi.

Mr. D. Hooper, Government Quinologist, Madras, writes to me as follows :—

Since writing to you about the *Podophyllum* root, a paper has been read on the chemistry of the resin at the British Pharmaceutical Conference at Edinburgh. Mr. Umney, the author, states that he has found less of the supposed active principle—podophyllotoxin—than there is in the root of the American *P. PELTATUM*. The

paper will appear in full in the Year Book of Pharmacy. Mr. Umney says in conclusion that the Indian drug should be used as an alternative source for the preparation of the official resin in the British Pharmacopœia. I am not satisfied with this result, and am writing to England saying that no conclusion should be drawn until a complete physiological examination has been made of the resin.

INDIAN MUSEUM,
CALCUTTA.

EDGAR THURSTON.

VII—TIMBER AND PRODUCE TRADE.

The Teak Market.

MESSRS. HOAR & BROWN'S report :—

		Tb.	Plks.	Blks.	Tl.
		Lds.	Lds.	Lds.	Lds.
Stock, 1st September 1892	...	5,419	1,391	60	7,905
Landings	...	nil.	100	23	123
		5,914	2,031	83	8,028
Deliveries	...	320	121	nil.	441
Stock, 30th September, 1892	...	5,594	1,910	13	7,587

The deliveries still continue dull, but a few contracts have been entered into for the supply of the Admiralty and other requirements, which will reduce the stock to some considerable extent. Business otherwise remains very quiet, and prices are unaltered. A further shipment from Bangkok has arrived, containing well-manufactured logs and planks, which ought to find a ready market.

MESSRS. DENNY, MOTT, & DICKSON'S report :—Deliveries last month from the docks in London were 465 loads, as against 1,470 loads for the corresponding month of last year.

The nine months ending September 30th show—

	1892.	1891.
Landings in London	5,406	10,858
Deliveries from London	7,497	11,076
Landed stocks in London on 30th September (exclusive of cargoes in course of discharge)	7,587	8,182
Entire floating supply for Europe (including cargoes in course of discharge) ...	19,800	13,400

*Of which fully one-third sold to go into direct consumption.

The above figures show a falling off of 50 per cent. imports and 33 per cent. in the consumption for the last nine months, so far as London is concerned. The imports to Europe for such nine months have been 33,500 loads as against 36,900 loads for the corresponding period of last year. Against this important decrease of 13,400 loads in the supplies, must be set off not only the diminished demand for consumption in the London district, but also perhaps quite as large a proportionate decrease in the consumption in the Clyde, Tyne, and Continent has also greatly fallen off—no doubt partly owing to the heavy increase in the French import duties on timber.

Notwithstanding the dulness of general trade and the hand to mouth character of this year's business, the consumption has exceeded the imports, with the result of reducing the unsold landed stock in Europe to a more moderate level than it has attained for years past; and this is unquestionably a very sound feature in the market.

The new season's supplies at the Burmah shipping ports are likely to exceed those of last year; and there will, therefore, doubtless be a tendency to increase next year's shipments to Europe. Shippers, however, complain that present prices are not remunerative, and may reasonably be expected to shrink from the heavy loss which shipments made without regard to actual requirements on this side invariably entail.

The closing three months of the year may (as was the case last year) possibly see a sudden improvement in the shipbuilding trade, which would materially affect prospects for the better; but prudent shippers will doubtless not commit themselves to heavy charter engagements until the end of the year shall give them a clearer view of the prospects on this side, as well as the new season's supplies to hand at the shipping ports from the Burmese forests. Siam supplies must not be ignored, but the difficulty of selling this Bangkok timber has not decreased, the few small cargoes which have been shipped this year having, as yet, mostly failed to find buyers; the distrust of this wood, by painful experience, giving it little chance of being imported at a profit—in any case, whilst the present moderate prices continue for the more-trusted Burmah timber.

Churchill and Sim's Circular.

December 7th, 1892.

EAST INDIAN TEAK.—The business for the month has been very similar to that of October, with perhaps a rather more distinct improvement than that then recorded. There is still, however, a want of life in this branch of the trade, which may be expected to last so long as the present depression in the shipping trade continues. The deliveries for the month have been 967 loads, against 1,020 and 882 in the two preceding years, and for the first eleven months 9,401 loads, against 13,341 and 15,382 in 1891 and 1890 respectively.

ROSEWOOD.—East India.—Some small sales have been made, but at rather easier prices.

SATINWOOD.—East India.—*Logs*, if large and figury would realise good prices, but other sorts are dull of sale; *planks* and *boards* are not wanted.

EBONY.—East India is only saleable occasionally and at low prices.

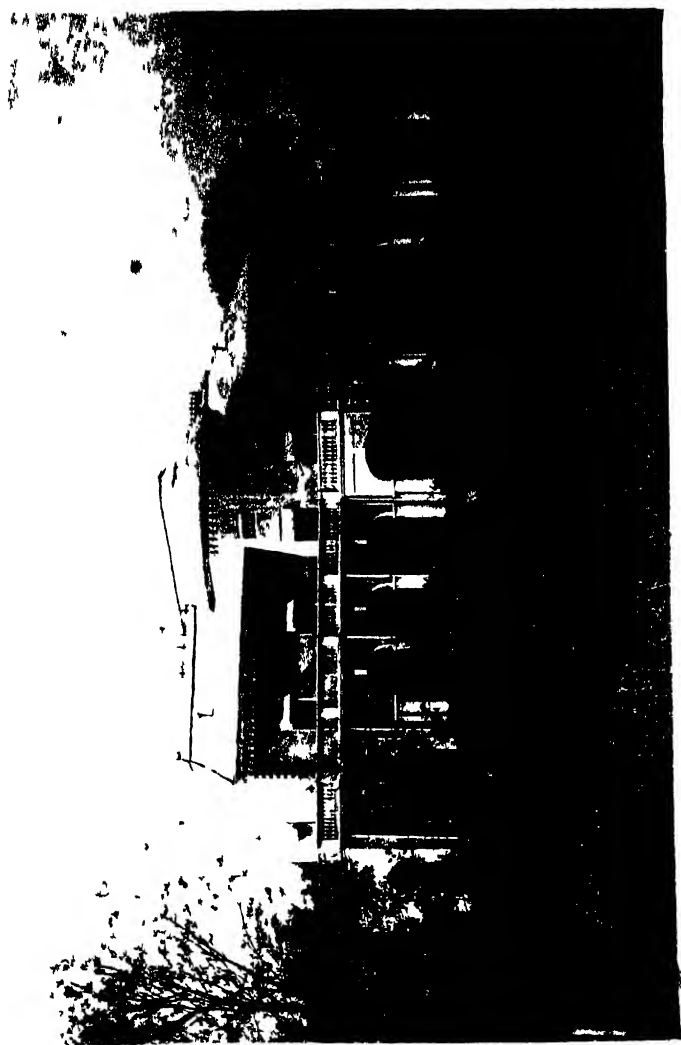
Price Current.

Indian Teak	per load	£9	10s.	to	£15
Satinwood	per ton	£5		to	£10
Rosewood	"	£5		to	£9
Ebony	"	£5		to	£8

MARKET RATES OF PRODUCTS.

(Tropical Agriculturist, December, 1892.)

Cardamoms	per lb.	2s.	to	2s. 6d.
Croton seeds	per cwt.	15s.	to	20s.
Cutch	"	20s.	to	32s.
Gum Arabic, Madras	"	40s.	to	80s.
Gum Kino	"	100s.	to	110s.
India Rubber, Assam	per lb.	1s. 6d.	to	2s. 1½d.
" Burma	"	1s. 5d.	to	1s. 9d.
Myrabolams, Bombay	per cwt	9s.	to	10s. 6d.
" Jubbulpore	"	8s. 1½d.	to	9s. 6d.
" Godavari	"	8s.	to	9s.
Nux Vomica, good	"	8s.	to	9s. 6d.
Orchella, Ceylon	"	22s.	to	28s.
Redwood	per ton	£3	to	£3-10s.
Sandal wood. logs	"	£35	to	£60
" chips	"	£9	to	£30



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Forest Administration in the Central Provinces.

In a recent article I endeavoured to explain the methods in force at the present moment for the management and administration of the Government Forests ; and the lines along which future legislation would, in all probability follow, judging by various Government Resolutions. It was there shewn that the present system consisted merely in the throwing open of whole forests to be exploited, throughout their length and breadth, at the will and pleasure of any purchaser of a licence, which licence entitled the holder to extract only the exact quantity of produce paid for, and lasted for the number of days required to extract the same.

Under the pending rules it was shewn, that, in addition to the above rules which would continue to remain in force, the intention would be, either to issue licenses to certain classes of people, which would entitle the holders to obtain from the forests all their personal requirements, in this line, for one year and for a fixed sum so calculated as to fall far below the actual existing value of the probable consumption of one family during that period ; or, to allow cultivators or agriculturists to obtain thorns for fencing, dead leaves, cow-dung, throughout the year *free of charge*, and to purchase the existing licenses for firewood, grass for thatching, wood for agricultural implements and bamboos at a rate *one third lower* than the ordinary district rate.

From the above it would appear that the only difference between the present and the proposed system lies, after all, in the fact that whereas at the present moment, a villager is compelled to obtain and pay for a separate license each time he wishes to extract produce from a forest ; under the proposed rules the cultivator would have free entry to the forests for certain produce, throughout the year, and would obtain the existing licenses for all other produce at greatly reduced rates.

Leaving out of consideration, consequently, all matters relating to the increasing difficulty of guarding the forests and of keeping any check on the produce removed, without a considerable increase in the present outdoor establishment, it would appear that the whole controversy between the existing and proposed systems would turn upon a question of lowering the rates, and increasing the freedom of the purchaser. It is well to say at once that even the most sanguine partisan of the present system would admit that it is "vicious in principle." This I attempted to explain in a previous article. But, it was there also stated that the proposed system would be a distinctly retrogressive step. It is necessary, therefore, to say a few words as to the probable evil effects of lowering the rates in a wholesale manner, for stress must be laid upon the fact that the Local Government has ruled that it will be absolutely necessary to abolish, once for all, the distinction between forest and forest in the same district, as regards the rates.

Now the existing rates are the outcome of many years of thought and consideration, change and trial. It must be acknowledged at once that these have been primarily fixed in reality upon merely commercial principles; and in accordance with the views expressed by Mr. Ribbentrop in his 'Note on the Forests of the Central Provinces,' viz :—"rates should vary with the distance of the forests from the market and with their accessibility. The rates must be lower for forests far removed, and higher for those in the immediate vicinity of the market." But far more lies hidden behind these apparently purely monetary or commercial laws. They have, in fact, constituted a perfect, though rough Working Plan, if such a term may be used; and have in all cases been a check in regulating the working or rather the outturn from the forests. To explain this it is sufficient to say that just as the rates were fixed in accordance with the demands on the forests, so the demand—that is the outturn—could be regulated by the rates; and, if the principle be correctly worked, it is possible to conceive that the rates could be so fixed that only the annual increment of the forests—or less than this—would alone be extracted. This is, in fact, exactly what has been done, in most cases, under the present system and with the present differential rates.

It will be seen, however, that whereas the present system is still imbued with those great evils, so fitly explained by a late Conservator, Colonel G. J. Vansomerén, in his Annual Report for the year 1890-91 (a); yet it had from a forestry point of view certain redeeming features, which it is now proposed to utterly disregard by a wholesale lowering of the rates. It is astonishing

(a). "Another great point to be aimed at is to begin measures for the gradual, but total, abolition of the system of selling wood and bamboos on licences. No forests into which a purchaser can go armed with an axe and a licence to fell trees and bamboos at his will can ever be said to be properly worked by us. The licence system, however carefully worked out in detail, is vicious in principle."

to think that in a province boasting of a Forest Department, such proposals were ever drafted; though I must admit that one of the desired results would thereby be attained. Now the objects the Government have in view are the following :—

- (1) The supply of plentiful and cheap grazing.
- (2) The supply of cheap fuel.
- (3) The supply of cheap wood or other material for agricultural purposes.

And to these I am compelled to add :—

- (4) The formation of Government Ryotwari Villages.

That these objects would be attained at once by throwing open all the forests, (without making any distinction between forest and forest) to the extraction of produce at extremely low or nominal rates, no one will deny. Neither will it be denied that the same objects could be attained, even more successfully, by doing away with that apparently unnecessary institution, the Forest Department, and allowing to the present generation a free entry and enjoyment of the forests. *Après nous le déluge*. It is not necessary to enter into a such question here : but before accepting so suicidal a policy, it would be well to see whether a solution on some kind of scientific principle could not be obtained.

In a previous article it was shewn that the forest area which falls to the sole charge of one single executive officer, unassisted by trained or competent assistants, is enormous. As an example, it is only necessary to mention the forest area of some of the larger districts :—

	Square miles.
Mandla, with a forest area of ...	... 3001
Raipur ... ..	... 1385
Hoshangabad ... ..	... 1919
Chanda ... ..	... 3486

It will be seen at once, therefore, that in framing any proposals for the working of the forests, and the attainment of the above-mentioned objects, a whole district or forest division cannot be taken as the unit. That is to say, that whatever proposals be drawn up, it will always be necessary that the inhabitants of one part of a district should be able to obtain all they require within a certain radius from their homes. And, through it would not be necessary to accept any such strict ruling as it was found necessary to adopt in the Thana Forests of the Bombay Presidency—namely “that the inhabitants of every village may be able to obtain from the annual coupes, material for tahal and firewood at a convenient distance from their village, which distance has been fixed as not more than four miles,” (*Indian Forester* for March 1892)—yet, something on these lines would have to be introduced at least during the first rotation.

Now every district is divided, with reference to the Government Forests situated in that district, into Ranges. These Ranges are naturally primarily purely forest divisions ; but with very exceptions, (a), which could either be rectified, or which would for special treatment, the various parts of a district inhabited under cultivation, would naturally look to one or other of Ranges for their forest supplies. It is, therefore, only necessary to take a Range, and as a rule, the existing Range, as the unit for working purposes : and within this Range all the different requirements of an agriculturist, or of an ordinary resident of the district would have to be supplied.

These requirements have been defined above and for the Range the following considerations would arise :—

- (1) The selection of culturable areas.
- (2) The formation of grazing areas.
- (3) The production of fuel.
- (4) The production of wood for agricultural purposes

The above to be supplied in sufficient quantities to the agriculturist. With reference to this matter, it need only here be mentioned, that many of the villages are in possession of the so-called Malguzari or " Communal forests, which were given to the Malguzars and the villagers, and are still maintained with the object of supplying the residents of the villages with free " nistar " or forest produce for home consumption. From this it will be seen that, after all, the call on any Range would at least, not at present, and not until the Malguzari had completely ruined their own forests, be of enormous extent except in those few Ranges in the adjoining properties in which communal or Malguzari Forests exist.

It now only remains to consider roughly how the objects enumerated above, may best be attained from a forestry point of view.

(1). THE SELECTION AND EXCISION OF CULTURABLE AREAS

In discussing this matter, the only point which must be kept in mind is that it is necessary, or at least advisable, to maintain a certain percentage of the area of a district under forests for the purpose of supplying forest produce to its inhabitants. Dr. Schimper in his " Manual of Forestry " has stated that for a nation, half an acre per head of inhabitants is a sufficient area to be kept in forest. But, as we have smaller units to deal with, and especially, if we bear in mind the large extent of forest at present under the management of the Forest Department, it would be as well to lay down a higher minimum, though

(a) I leave out of consideration here those areas or ranges situated in habitations as a rule, surrounded on all sides by other Government Forests. These will be treated of separately. They would, for the present, constitute the " High Forests."

physical features of the ground and its culturability would naturally largely affect this point ; as would also the extent of private Malguzari Forests.

The mere procedure of selecting the culturable areas would present no difficulties. Sufficient data could be supplied at once by the Divisional Officers and it would only be necessary to depute specially selected officers either from the Commission, or from the Forest Department to visit these areas, and demarcate and excise those suitable and required for the formation of ryotwari villages. As soon as this work was completed, the areas and boundaries of the Government Forests would be fixed once for all. The work is undoubtedly one of some importance ; but it is neither one which would entail great labour, nor occupy considerable time, owing to the present satisfactory upkeep of the existing boundary lines, though the interior of the forests may, in certain cases, be more or less cut up with patch cultivation and even villages.

(II). THE FORMATION OF GRAZING AREAS.

Here again no great difficulties should be experienced. The difficulty, on the contrary, would be to curtail the areas which would naturally fall under this head. In every district there are large and extensive tracts, covered with little else but grass. These would naturally fall under grazing areas for they could never be re-stocked unless a very large, and a very doubtful expenditure, were incurred for artificial reproduction. Besides these, there are innumerable tracts varying in degree from almost barren areas, devoid of tree vegetation, to areas fairly well stocked. A certain amount of discretion would eventually have to be exercised in classing these areas ; though the extent of the grazing and grass demands, and the extent of the forest area available for the pole and fuel forests, would practically determine for or against the inclusion of any particular area among the grazing class. Moreover, at the commencement, many of the areas could in a way form part of the grazing areas by being treated on a selection system combined with a system of areas, a certain part of the forest thus yearly remaining opened to grazing. We next come to consider :—

(III).—THE FORMATION OF FUEL AND (IV) POLE FORESTS.

It is as well to say at once that, as far as the forests of these Provinces are concerned, speaking generally, no particular type of forest can be said to prevail throughout a forest, and, moreover, every forest is abnormal as regards its composition. The result is that in each case the particular type of forest required would, so to speak, have to be made and this, as far as possible, during the first rotation. And the forest would be made in accordance with the sylvicultural system selected. Or, as our object is to produce fuel and poles, all that need be aimed at or necessary, would

be the conversion of the irregular forest into coppice—or coppice with standards, for by such a silvicultural system all our requirements would be produced.* It is well known that this system of coppice is the most simple to introduce, and further that by the system of areas, the age gradation with their corresponding areas will be more quickly established. And though it may be true that, by this method, during the first rotation, uneven annual returns will be obtained; and that when the abnormal state of a forest is due to the fact that (a) the normal age gradations with their corresponding areas, (b) the normal growing stock, and (c) the normal increment, are missing, that the normal increment should be first established; yet, with our present knowledge, and with the present staff, all that could be expected would be to introduce a system of areas, the size of the areas of each annual coupe being, as far as possible, on the inverse ratio of the quality of the soil, and, perhaps, of the stocking; though with regard to the latter, as the several working sections would be abnormal, they could assist each other in order to obtain a full yield.

These, however, are purely technical questions which the Working Plans Officers would naturally solve, and could present no insurmountable difficulties. All we wish to attempt, at the present moment, is to show that the objects the Local Government have at heart can be solved by the principles of forestry, and simply by the formation of

(a). Grazing areas.

(b). Fuel and pole, or Coppice Forests.

Naturally, the above is merely an outline of the course which might be adopted in attempting to legislate for the working of the forests. We cannot here attempt to enter into details. Besides the matters above referred to, however, other types of forests and systems of working would necessarily present themselves—a few of which we may here mention.

Thus in the case of the teak-bearing tracts, the constitution of these into pole or high forest to be worked on a selection system would naturally suggest itself. The type of forest known as "Mixed" or "High mixed forests" would suggest a selection system, combined with a system of areas so that grazing might be yearly permitted over a proportion of the total area. And so on. Lastly it would appear necessary to say a few words with reference to the more inaccessible forests, meaning by this, those which are

*I would point out here that in each district, if not in each range, there exist certain areas, more or less extensive, which owing to their present composition would naturally be first selected as coppice forests. In fact, if any type of forest is at all worked—leaving out of consideration the real teak-bearing areas—it is these more or less dense or irregular coppice or scrub jungles. All that we could expect to do would be to work these coppice with standard forests on a rough system of areas, taking a fairly low rotation, leaving a large percentage of standards, at least during the first rotation, or what would more correctly be called preparatory period.

further removed from cultivation, and on which, consequently, there is little or no immediate local demand. There can be no doubt that these, especially as they are at the present moment, as a rule, stocked with fairly large timber trees, should be maintained as such and constituted into High Forests. The present policy tends to insist on the fact that nothing but "poles and small building wood, fuel, light fencing material as thorns, and brushwood for stack floors" should be produced. This is all very well as far as it goes, but may be carried too far, especially if too rigidly adhered to. It may be true that "*the people at large want very little large timber, and the increasing use by Railways of metal sleepers renders the chances of selling wood of large scantling smaller than ever,*" but it is more than probable that a certain quantity of large timber is required and will be required in the future, and unless Government continues to see to its production, it will not be available when required, as private owners and Malguzars cannot be expected to lay out the necessary capital, or put off the realization of an early return from their forests—more especially when it is considered how improvident the Malguzars of these Provinces usually are and how little store they lay even on the mere maintenance of their forests.

This being the case, whenever a forest is removed from cultivation, and from immediate local demands, and as long as it will lend itself to its formation into a High Forest—this system should be adopted.

A few more words in conclusion. As far as their forest administration is concerned, the present Local Government appear to be possessed with the very praiseworthy desire of seeking to provide for the welfare and well being of the agriculturists, by supplying at cheap rates, all their forest requirements. Sufficient has been said to show us that it is not by the maintenance of the existing systems and by a wholesale lowering of the existing rates, that these objects will be permanently attained. A solution can only be found in the introduction of Working Plans. Once these are introduced, it matters little from a purely forestry point of view, whether the produce to be removed yearly, the annual increment, be given away free, or be sold at low, moderate or even high rates.

As already remarked, it would appear that the Local Government aims at a higher ideal than that of merely raising as high a forest nett revenue as possible by any means, fair or foul, that may suggest themselves. This being the case, the present moment would appear most propitious for the introduction of a systematic system of working the forests. Let not the attainment of a high nett revenue be made so much the object of the Department, and the criterion by which its work is judged and its existence justified. Rather let it be insisted upon that scientific working of the forests should be introduced without further delay whenever expedient or possible. This should be the true aim of a Forest

Department. The present nett revenue might well be even wholly discarded, if by this means a sound system of working the forests be introduced and established ; the agriculturist be provided in abundance and at cheap rates with the produce he requires and to which he would appear to be entitled ; and some trustworthy data relating to the growth of the different trees, and other sylvicultural matters be obtained. (*Vide* page 10, para 35, of the Progress Report of the Northern Circle, Central Provinces, for the year 1890-91). In praise of the Department, it may be said, that all, or almost all, that can be attained by the existing indigenous systems, namely—a very high revenue ; a small expenditure ; in almost all forests a wonderfully improved and in many cases a good growing stock ; all these have been attained. But during the last few years the Department appears to have been sleeping on its laurels, only striving to increase its revenue. It is now time to make a fresh start. Working Plans, rest houses and accommodation for the office and out-door establishment, roads and paths, the collection of information relating to the forests and their constitution, a large and very needed increase in the out-door establishment—all these, and many more equally important matters must be taken in hand and started.

But—and it is a very big *but*—all this naturally means expenditure, and at first, a fall on the gross revenue ; and few, if any, wish to take this leap into the dark—though he may be sure of light and brightness ahead. The initiation therefore appears to rest with those in higher authority.

TUSCAN.

NEW ARRANGEMENTS FOR Practical Work for the Coopers Hill students.

We have recently received copies of Dr. Schlich's and Sir D. Brandis's proposals regarding the arrangement of studies of the Forest Students at Coopers Hill, with a view to lengthening the time devoted to practical work in the forests of the Continent, now that the Forestry Course has been extended to three years.

Sir D. Brandis suggested two projects, together with an estimate of the probable cost of each, (a) that students should undergo five months apprenticeship under a German Forest Officer or (b) four and a half months apprenticeship under a German Forest Officer, followed by forty days touring with himself.

As these two schemes provide for different periods of time, Dr. Schlich has added a third modification, namely, (c) three and a half months' apprenticeship under a German Forest Officer, followed by 40 days touring with Sir D. Brandis. Scheme (c) is thus an alternative for scheme (a), supposing the practical training on the Continent to be restricted to five months.

Either of these schemes entails a considerable increase in the cost of the training scheme, (c) being the more expensive of the two.

Sir D. Brandis prefers that the practical work should be done in the fourth half year rather than at the end of the course. Should this course be decided on, Dr. Schlich recommends the adoption of scheme (a), whereas, were the practical work done at the end of the course, he considers scheme (c) preferable, as the students would then be better able to appreciate the varying conditions and methods of treatment found in a variety of districts. In the event of the former method being adopted, Dr. Schlich makes an addition by proposing that three or four of the best men of each year who have evinced a genuine interest in their profession, should be permitted to visit a few specially interesting districts of the Continent, so as to enlarge their views on their way to join their appointments in India. The proposals then stand as follows :—

(1). The students to remain at the College for the first eighteen months to study auxiliary sciences, the principles of silviculture, and forest mensuration, accompanied by work in the forest nursery, visits to neighbouring woods, Caesar's Camp school forest, and some specially selected forests in Normandy.

(2). Practical work in Germany from about the 1st April in the second year of the course, until the beginning of September of the same year, the students to be placed two and two under selected Prussian Oberförsters.

(3). The students to remain at the College throughout the third year of the course to complete the study of forestry in the class room and in Caesar's Camp school forests, including the preparation of a complete Working Plan.

(4). Some of the most promising students to be deputed to visit a few specially interesting forest districts on their way to India, such students to be selected by the President of the College in consultation with the Principal Professor of Forestry.

Should these proposals be sanctioned, as we understand that they have been, the first batch of students who would go to Germany are those who joined the College in September 1891, the men who joined in September 1890 being dealt with on the old lines.

Notes on the State Forest of Lyons (Normandy).

(*Prepared by Monsieur Le Père, Inspecteur des Forêts, Lyons.
Translated into English by Mr. W. R. Fisher, Assistant
Professor of Forestry, Coopers Hill College.*)

Area and locality.—The State forest of Lyons contains an area of 26,211 acres.

It is situated 20 miles from Rouen, in the two Departments of the Eure and the Lower Seine, and extends over a tract of country bordered as follows:—North, by the plain of Argueil; east, by the valley of Epte; south, by the plains of Norman Vexin; south-west, west, and north-west, the valleys of Fouillebrocque, of the Lieure, and of Andelle.

This tract, owing to its configuration, as well as to the varieties of its soil, affords characteristic examples of the various aspects of Normandy with its forests, meadows, and arable lands.

The Department boundary line divides the forest into two nearly equal portions—in the north, the blocks of Fleury and Gourvinay, with an area of about 11,293 acres; and in the south, the blocks of Fleury sur Andelle, Lyons, and Etrépnay, with an area of 14,918 acres.

A polygon surrounding the forest would be no less than 42 miles in perimeter, its greatest breadth from east to west, as well as from north to south, being about 14 miles.

The forest is demarcated by boundary pillars along a total length of 203 miles. The little town of Lyons is situated in the valley of the Lieure, in a nearly central position as regards the forest, which descends to the banks of the Andelle in the south-west from the elevated plateau of Beauvoir in the north-east. The altitude of the forest above sea level varies from 164 to 722 feet.

More than half the forest is situated on undulating ground, and it is almost cut in half from north-east to south-west by the fairly deep valley of the Lieure and the depressions leading into it. The depressions of Fouillebrocque and of St. Catherine's springs subdivide it in the south, parallel to the valley of the Lieure.

The River Lieure, which springs up in the forest at Holly fountain, bounds its eastern blocks to the south in a pretty deep valley, into which several depressions, coming down from the forest, lead.

Climate.—The forest of Lyons almost everywhere shows a remarkable vigour of growth due to the mild and moist climate of a region not far removed from the sea.

Soil.—The soil is formed by the weathering of secondary and tertiary geological strata; the former is only exposed in the lower part of the valleys, and belongs to the upper cretaceous formation, consisting of nearly horizontal beds of white chalk, with numerous layers of flints. The tertiary strata are much less regular and form

the subsoil over the greater portion of the forest area. They contain many different mineralogical elements—flints, gravel, quartz, sand, sandstone, dry sandy marls, plastic clay containing iron, &c. The latter is found in the depressions of the silicious strata, consisting of sand, sandstone, and rolled flints. Such a deposit occurs between Lyons and Gisors. The strata near Hogues are remarkable for a mass of ochraceous sand, puddingstone, and massive sandstone. Everywhere on the surface of the Lyons block, sandstone and flints abound. Near Mont-Itoti, the strata contain bright variegated quartz. From several places sand, clay, and sandstone are exported, and almost everywhere the flints are utilized for road metalling.

The soil formed from very variable proportions of the debris of those different elements varies considerably over small areas, sometimes attaining a depth of 13 feet, at others being reduced to a superficial coating of hardly eight inches.

The amount of moisture in the soil varies according to its composition and gradient, the soil being generally moist and permeable. Marshy ground only occurs in patches, 7·4 acres at Hotel-à-Dieu, and has almost disappeared owing to drainage works executed about 15 years ago; but ponds are not uncommon, and have served in the nomenclature of several compartments. One of them has given its name to the celebrated abbey of Mortemer, the picturesque ruins of which still exist. These ponds appear to have been excavated near old dwellings, traces of which are still visible.

About one fifth of the forest area may be classed with neighbouring first-class arable lands, one fifth as second class, two fifths as third class, and the remaining one fifth as fourth class. The estimated value of the forest land formerly placed at 16*l.* to 40*l.* per acre, would now be too high.

Species.—The forest of Lyons is pre-eminently a beech forest. This species occupies more than two-thirds of the area; it attains here very fine dimensions at a comparatively low age. One frequently sees beeches only 100 to 120 years old with a height of 131 feet and a diameter of 20 to 28 inches, measured at 3·3 inches from the ground.

The wood of Castelier, 150 to 230 years old, contains more than 14,291 cubic feet per acre, the trees there having a mean height of 148 feet (*vide* Appendix).

The hornbeam and the oak are mixed unequally with the beech, the proportion of the oak being less than one fifth of the stock. The wild cherry, ash, birch, aspen, and sallow only appear occasionally, the two latter merely in the young thickets, before cleanings have been made.

A few small woods of Scotch pine may also be noted, situated on soils at present too poor for broad-leaved species.

The sycamore and elm have been introduced into some old blanks.

Nature of the stock, its age, and density of growth.—Most of the forest is composed of woods with a proper succession of ages

up to 120 years. Some few woods are 150 to 160 years old. Nearly everywhere in the regeneration felling the presence of a certain number of old standards compensates for the relatively low age of the rest of the crop. On the whole, middle-aged trees somewhat preponderate.

Few other forests in France are so completely stocked. Blanks are almost entirely unknown, and plantations are only required to complete the natural regeneration, at the extremely rare places where it is delayed beyond the usual time. These plantations are generally made to introduce oak into pure beech woods.

From time immemorial, the forest of Lyons has been treated according to the regular high forest system, and it is due to this treatment that its woods are so exceptionally well stocked.

WORKING PLAN OF THE FOREST.

Method of working.—The forest of Lyons is treated as high forest by the shelter-wood compartment system (*Méthode de réensemencement naturel et des claircies*),

The working plan sanctioned in 1862, but actually applied since 1856, divides the forest into 15 working sections (*series*), with a rotation of 150 years for each, which is subdivided into six periods of 25 years each for working sections 1 to 12 and 14. The area to be worked in each period is termed a periodic block.

At the end of the first period, 1881, the revision of the working plan was carried out for these 13 sections, the annual yield of the principal felling being calculated for the second period. The allocation of the improvement felling (thinnings and cleanings) was at the same time fixed for the second period, each compartment to be gone over twice during the period.

In the 13th and 15th working sections the rotation was subdivided into five periods of 30 years each, and the first period expired in 1885. The revision of the working plan for these sections took place in 1886, and the allocation of the improvement felling made; they will go over the ground three times during each period of 30 years. The forest, therefore, for 13 working circles is in the eleventh year of the second period, and for the two others in the seventh year of the second period (in 1892).

Principal felling.—Three regeneration felling (seeding, secondary, and final felling) are carried out, as, although natural regeneration is certain, it is not rapid enough for the seed-bearers to be removed in one felling, and they are also useful in affording protection to the young crop.

At present, in the middle of the second period, seeding felling is most frequent.

Secondary felling have, nevertheless, been made in some of the working sections, in the first seeding felling of the second periodic blocks. Certain portions of these felling, where the regeneration has been very favourable, are already partially under the final felling.

Improvement fellings.—The improvement fellings are regulated by area. These fellings, during each period, go over all the periodic blocks which are not under regeneration; that is to say, for the second period, the 1st, 3rd, 4th, 5th, and 6th periodic blocks, except in the 13th and 15th sections, which have only five periodic blocks.

Accordingly, as these fellings must recur twice or thrice in each period, the total area is divided by one half or by one third the number of years in the period, and thus the area of the annual improvement fellings is calculated.

The subdivision of the periodic blocks into areas for each annual thinning has been marked out on the ground, thus perpetuating the regular course of these fellings.

In the young woods of the first periodic blocks, the improvement fellings are at present cleanings (removal of soft woods and setting free valuable species); in the other periodic blocks they are ordinary thinnings, that is removal of suppressed, defective, or dying trees, setting free oaks, and sometimes in the 5th or 6th periodic blocks, felling certain old trees which cannot be expected to live until the 5th or 6th periods, and so well surrounded by the younger growth that there is no danger of the crop being over thinned.

YIELD; NATURE OF FOREST PRODUCE AND MARKET FOR IT.

Yield.—The annual yield of the forest of Lyons is more than 988,837 c. feet of principal produce (from regeneration fellings calculated by volume), and of nearly 1,977 acres of improvement fellings, yielding more than 30,000 stères and 200,000 faggots, representing 847,575 c. feet or a total annual yield for the forest of 1,836,412 c. feet, about 71 c. feet per acre.

This figure does not exceed the annual increment, and may be increased when a regular gradation of ages has been everywhere established throughout the forest.

The figure of 5,716 c. feet per acre, representing the actual mean volume of the mature standing crop now being regenerated, and of which the average age hardly exceeds 100 years, and which has already furnished a nearly equal volume under the head of thinnings, proves the correctness of this estimate.

Marketable produce.—The oak (sessile and pedunculate), the beech, hornbeam, wild cherry, birch, ash, and maple, are the chief marketable species of the forest of Lyons. We merely mention the aspen, sawallow, and scotch pine, which up to the present time have only yielded produce in the cleanings, all faggots, except a few pine poles.

Oak.—Oak of good quality is exported from the forest in logs, or planks. Second-class trees are sawn up into railway sleepers, beams, or split into staves, park palings, wheel spokes, &c. The crowns of large trees and all small oak wood are sold for fuel.

Oak trees of moderate size are not much in demand. The price of oak railway sleepers has gone down almost to the same figure as for beech. Beams for use in construction, find few purchasers. This is due to the competition of iron girders, and of imported wood. Hardly any oak bark is sold in the forest of Lyons.

Beech.—The demands for beech have varied considerably during the last few years.

After having experienced a depression of nearly 6 per cent. from 1880 to 1886, owing to the cessation of the trade in railway sleepers, and to the diminution of that of sabots, beech has recently somewhat recovered in price; railway sleepers are regularly sold from the fellings, certainly at rather a low price, but still this assures a sale for beechwood of large dimensions, and secures a better price for firewood.

The sabot industry also absorbs a number of middling-sized beech trees; the finest wood is, however, exported in logs for the Parisian sawmills, or those of the neighbourhood, where they are converted into planks for furniture, or into coopers' wood.

A large proportion of the beech wood is used for fuel in the neighbourhood of the forest, or at Rouen and Elbeuf, some firewood from the centre parts of the forest going to Paris.

Hornbeam.—The finest pieces of hornbeam are used for the sabot and other industries; most of this wood, however, is used for fuel in the same localities as beech wood.

Wild Cherry.—The wild cherry is greatly in demand for the saw-mills for chair making. Some fine trees of this species are found in the forest.

Ash.—Ash is only found of a limited size and is therefore only used for certain homely purposes, poles, &c. Very little wood of this species is large enough for wheelwrights' work, but there will be a fair supply when certain woods come under the axe.

Birch.—The same remarks apply here as for the ash. A few trees become large enough for sabot making, but the wood is generally used for fuel. This is also the case as regards the field maple, its dimensions being inadequate for other employment.

The sycamore and the elm are only found in plantations and have not yet come into use.

The other inferior species are only made into faggots coming from the cleanings, or in charcoal wood.

Scotch pine.—The Scotch pine is restricted to 148 acres in the forest of Lyons, and has hitherto only been felled in cleanings or thinnings, and furnishes posts for fences, and firewood.

Trade in firewood.—Firewood in the forest of Lyons is sold as split wood of different lengths, and as round wood 2ft. 2in. long, and as wood for charcoal. This last product is only of limited importance and its preparation only increases when the price of firewood is particularly low. Charcoal is then made, in order to reduce the transport and secure a rapid clearance of the fellings. Not more than one-tenth of the firewood is so employed.

Carbonisation is effected at Lyons, and in the forest in very small kilns of from 283 to 706 stacked c. feet.

The demand for faggots varies considerably, but on account of their relatively small number and the minute subdivision of the forest, a number of ready purchasers are secured.

Price of material.—The price of wood in the forest of Lyons has not only followed the general fall in prices which has prevailed during the last few years, on account of the competition of iron and imported timber, but this has been aggravated locally by the difficulty and the high price of labour.

The fact that firewood at Lyons is only worth three-fifths of its price at Rouen 24 miles distant, shows how important it is to improve the means of transport.

The average price of the cubic metre of standing timber, inclusive of stem, top, and branches, has been, during the last ten years 2½*d.* a cubic foot for the principal fellings, and 1½*d.* a cubic foot for the thinnings. This gives a mean annual revenue of 15,840*l.* or 12*s.* 6*d.* an acre, for the whole forest; or of 13*s.* 4*d.* per acre if we include the value of the minor produce.

This figure is very inferior to the normal revenue; it exceeded 1*l.* 3*s.* 4*d.* per acre in 1830, and it is to be hoped that it will soon go up at least to 16*s.* 8*d.* per acre, when the present commercial crisis has terminated.

Minor produce.—Independently of the saleable wood, and of the dead wood given away to the neighbouring poor people, the forest of Lyons yields certain accessory produce, the value of which is realised either in cash or in daily labour.

First of all in the former category comes the game, which produces 880*l.* a year.

The total yield in money of the other minor produce, quarries, removal of clay, sand, ferns, plants, &c, is not of much importance, about 160*l.* The numerous quarries opened out in the forest cause a much greater loss than their receipts but their concession is necessary in the public interest.

Concessions of standing dead wood, of ferns, or heather, are repaid by daily labour at the rate of 70·6 stacked c. feet or 50 bundles for each day. The same may be said of pannage, one day for each pig during a season of six months. These days form a precious resource for the maintenance of roads, and the execution of urgent and unforeseen works.

DETAILED ACCOUNT OF THE METHOD OF SELECTING TREES TO BE FELLED.

Seeding fellings.—In a normal wood of the dense growth found at Lyons, the trees reserved at a seeding felling are in number about one third of the standing crop, but only one half in volume,

as the finest middle-aged trees are selected as seed-bearers. The oldest beech are generally felled, as middle-aged trees are more fertile, and yield seed of a better quality.

Preference is always given to oak, already so scarce in the forest, and care is taken to concentrate the seed-bearers of this species, as its light shade requires concentration to protect the seedlings from frost and drought. The extraction of the stumps of most of the felled trees is a good preparation for natural regeneration, which is also facilitated wherever necessary by the use of the *Bienvenu* forest plough.

This plough, invented by M. *Bienvenu*, at present Honorary Sub-Inspector of Forests, is constructed like a cultivator with three teeth, each placed on a spring strong enough not to yield in ordinary work, but only when it meets with an obstacle such as a root or large stone. A double lever also affords means of regulating at will the depth of the work, and of raising the whole apparatus so as to avoid obstacles, or portions of ground already stocked, which are not to be ploughed up.

The instrument is worked by one man and two horses, but on ground very weedy, or covered with brambles, two men are required, one to drive the plough, and the other to free the instrument from weeds from time to time. The best and most economical results have been obtained by the use of this instrument, which works fast and well. Hoing is only employed in places where the soil is too stony or too steep, or in out-of-the-way places too small to repay the cost of transport of the plough. Owing to the necessity for working a great number of places in the forest, the operation is carried on both before and after the fall of the mast. The work done is useful in both cases; if before the fall of the mast, the latter gets on to loose soil and is covered by the dead leaves; if after it, a large quantity of mast is buried in the ground. The latter method is preferable in woods most frequented by red deer, especially by hinds. The plough costs 16*l*.

Secondary and final fellings.—The location of the fellings depends on the condition of the young crops and the limit fixed for the annual yield. In every working section, therefore, fellings considered necessary on account of the state of the young growth are always made before commencing to regenerate a new area by a seeding felling.

In the forest of Lyons, where the beech predominates, the work is facilitated by the faculty which this species possesses for supporting prolonged shade. As the oak differs in this respect, great care is taken to set free its seedlings as soon as this becomes necessary.

The course of regeneration being naturally irregular, the secondary and final fellings are frequently amalgamated into one, which is called a secondary felling in some cases and a final felling in others.

The secondary fellings generally follow six to eight years after the seeding fellings, and are themselves pretty quickly followed by the final fellings. The regeneration is therefore completed in from ten to fifteen years at the outside.

Compartment where the oak predominates form exceptions to this rule, and if the seeding may have to be awaited as long as for the beech, it is completed more rapidly, but unfortunately is more difficult to secure.

Thinnings.—Most of the thinnings are sold standing by unit of produce which method is profitable financially and sylviculturally. The trees to be felled are marked either with the forest guard's hammer or with the marker; the merchant then fells and converts them, the produce being afterwards measured and its price regulated at the rate agreed upon at the auction.

By this method, the forest officials can, at any time, during the felling, increase or correct the markings. The necessity for carefully preserving the oak in the Lyons forest renders this method peculiarly valuable.

As thinnings are made by area, marking for them merely follows sylvicultural rules. Generally they are limited to the removal of dying and suppressed trees; under the light cover of the oaks, even hornbeam of little promise is left, being useful in keeping up the density of the leaf canopy. The operation follows nature, rarely forestalls it. The forester is guided also by the state of the crop and quality of the soil, marking lightly on poor soil and warm aspects, but more boldly wherever a vigorous growth allows him to reduce the number of stems without endangering the density of the woods.

While strictly respecting these rules, the compact condition of the woods renders the produce of the thinnings very large: the last thinnings executed produced more than 714 c. feet and 120 faggots per acre. Some woods actually yield 1,143 stacked cubic feet per acre.

Cleanings.—The cleanings are made at the expense of the State, and for them a special credit is afforded, whilst the produce is sold and the price credited to the State. These operations have for their object not only to thin out the over-dense thickets of young wood, but also and chiefly to protect valuable species, and especially oaks. With this object in view, one need have no hesitation in removing or pruning a beech, hornbeam, or other species which is threatening young oak saplings.

The sale of the produce of a cleaning frequently scarcely covers its cost, but their future usefulness gives them great importance. No markings can be made in these fellings on account of the great number and small size of the stems, and the work can only be entrusted to skilled workmen constantly supervised and directed by the guards and forest officers.

APPENDIX.

Note on Compartment B², Canton du Castelier, in the 12th working section. (Area 67·88 acres.)

This compartment contains 4,660 trees (173 oaks, 4,244 beech, 243 hornbeam), or 69 trees per acre. The trees have an average age of 160 years, with some old standards 180—240 years old. The average volume is 14,291 c. feet per acre.

Some sample areas chosen in the best part of the wood, show :—

1. For the area containing the trees-largest in diameter, 48 trees per acre cubing 15,578 c. feet per acre, an average of 345 c. feet per tree.
- 2 For the part of the area where the trees are tallest, 81 trees, and 15,006 c. feet per acre, 185 c. feet for the average tree.

Taking the wood as a whole, the mean height of all the trees is nearly 184 feet, some trees even attaining 164 feet. The diameters at 3·3 feet from the ground vary from 14 in. to 43 in. and the law of diminution of these diameters (the rate at which the trees taper with elevation above the ground) varies between 1 per cent. for trees below 4·9 feet 3·3 feet from the ground, and at the most 2 per cent. for the tallest trees. The total surface of the horizontal sections of the stems measured at 3·3 feet from the ground is $\frac{1}{2\frac{1}{17}}$ ths of the total area of the compartment.

COOPERS HILL.

6th July 1892.

Insects injurious to Coniferæ.

The following extracts from a valuable paper by Mr. W. F. H. Blandford, M. A., F. Z. S., &c., published in the Journal of the Royal Horticultural Society, will be of interest to our readers.

“Of all families of trees, the Coniferæ suffer most severely from the attacks of insects, owing to the large number of species which they support, and to the difficulty which, on account of their physiological characteristics, they have in withstanding injury.

‘The wide area over which forests of these trees extend increases the danger of insect-attacks, in accordance with a well-known law which holds with injurious insects; and it is among Coniferæ alone among trees, and among the forest-species of Pine, Fir, and Larch—for the Yews, Cypressess, Thuyas, &c, do

'not now concern us—that have happened those repeated instances
'of widespread destruction over large forest areas which, occurring
'even before economic forestry began to change the character of
'the primitive mixed woods, probably increased in number and
'severity at that epoch, and have continued at intervals to the present day.

'A striking example of this destruction is that which happened
'in the period 1853-68, in East Prussia, Poland, and Russia,
'when the Spruce was killed over an area of 7,000 square
'German miles. A similar instance is that afforded last year in
'the Bavarian forests by the plague of the same destructive insect (*Liparis monacha*); the loss caused by this to the revenue
'was estimated at £40,000.

'The immense importance of these attacks has given an impetus to the study of forest-insects on the Continent, and a not
'inconsiderable mass of literature has sprung up. In this the
'foremost place must be given to the works of Ratzeburg, who
'was the first to place this branch of entomology on a truly scientific basis.

'In the large number of insects feeding on these trees, only a
'few are of habitual importance, but exceptional abundance of a
'normally unimportant species, will bring about unexpected damage.
'This sometimes occurs in Great Britain, and I have heard complaints of damage which was not assignable to any of the regular
'destroyers, but which could not be identified in the absence of
'specimens.

'Now the standpoint of the systematic entomologist or of the collector, is not the same as that of the economist, and papers
'written by the one will not always serve for the enlightenment of the other. The former is apt to neglect certain small points bearing on the habits of the insect which do not immediately concern him, and especially those connected with the appearance, vitality, and aftergrowth of the plant on which his prey lives; while the economist, more particularly the practical forester, who thinks
'more of the injured plants than of the destroyer, has occasionally a royal disregard of the sordid details of specific characters, which
'brings him into trouble when he discovers that closely allied species often have remarkably different life-histories. In writing
'the account of any new injurious insect, it is essential that an exact determination of the species shall be made, and the life-history constructed as completely as possible from personal observation, especially with regard to times of appearance, or if
'already recorded, it should be verified by observed facts.

'The special liability of some Coniferæ (*Pinus*, *Picea*, *Abies*, *Larix*) to injury by insects, and the important character of such injury, are due to the following facts.

'1. There is a very large number of insects which attack them. Kaltenbach enumerates; 299 on the forest conifers in Europe. This number falls, indeed, far short of the 537 assigned to

'the Oak, but neither list can be taken as strictly accurate. Many species are omitted, especially from the former list, while in the case of the Oak the number appears to be swelled by the dragging in of species having little real connection with that tree.

'In Ratzeburg's "*Forest-Insekten*" 95 species are tabulated as injuring Coniferæ, while only 36 are referred to the Oak ; but subsequent researches would increase both these figures.

'2. Every part of the tree is liable to energetic attacks from one insect or another—the roots, the bark of the trunk and branches, the wood, needles, shoots, and lastly the cones, the seed-production of which may be greatly lessened by insects feeding in their interior.

'3. A common form of injury, especially on the Continent, is defoliation. Now complete defoliation of a Conifer, other than the Larch, usually means the death of the tree, because of the slowness with which the injury is repaired.

'If an Oak is stripped by *Tortrix viridana*—an annual occurrence in many English woods—or a Hawthorn by *Hyponomeuta padella*, as in our London parks and gardens, the tree generally grows a new crop of leaves late in the year, provided that the defoliation is sufficiently complete and sufficiently early ; but if a Spruce or Pine be stripped and survive, not only are no further needles produced the same year, but next year's growth may be delayed a month, and the new needles are stunted and form the curious bristle-needles figured by Ratzeburg. The tree will take four or five years to recover its normal covering of needles, and with them its normal process of growth ; so that during that period the total increment will only equal, or may even be less than, that of a single ordinary season.

'4. Defoliation renders a tree liable to the attacks of other insects, especially of the much-dreaded bark-beetles, which have so often completed the havoc begun in European forests by hordes of caterpillars. I do not intend to discuss here all the various aspects of the perennial and much-vexed question as to the economic importance of these and other wood-feeding insects and the susceptibility of perfectly healthy trees to their attacks, but reference to it cannot be entirely omitted.

'It may be true that bark-beetles and longicorns never attack a tree in perfect health ; that is the opinion of many entomologists, whose number by no means includes all those whose familiarity with forestry compels them to keep sight of the practical side of the question—men like Eichhoff, the leading authority on these beetles and the head of a large forest-district, Judeich and Nitsche, &c. Yet a disease would not be considered unimportant by the physician because it rarely or never attacked the robust ; if it occurred as the sequela of other complaints, killing patients whose recovery would have been certain, it would demand serious attention. So these beetles, as the health of every

'tree in a forest cannot be assured, still possess importance even if
'their attacks are limited to the sickly plant.

'But though no one doubts that they, in common with all
'insects, prefer an unhealthy plant to a healthy one, they may not
'always reject the latter. Here in Great Britain there is great
'difficulty in arriving at a just conclusion, for many injurious
'species are unknown or are exceedingly rare, and it is dangerous
'to argue about the habits of any one kind from analogy with those
'of another. Though a species breeding in small numbers in a
'wood with plenty of brood-material may let alone timber which it
'would attack if it were present from any cause in immense
'swarms impelled by the necessity of egg-laying and with lack of
'suitable breeding-places, there is yet evidence that these insects,
'if dying or injured wood is not at hand, attack sound trees for
'egg-laying, and if the assault does not succeed, the large number
'of attempted burrows serve to weaken the tree, which may
'succumb after several repetitions. When it is recollected that a
'square metre of bark has been known to contain nearly five
'thousand larvæ of *Tomicus typographus*, it will be seen that a
'large quantity of suitable breeding-material may cause an increase
'in the numbers of these insects that will jeopardise the healthy
'trees. A particular form of injury inflicted by some of these
'beetles is that of attacking and breeding in the crown and upper
'branches of old trees whose vitality is not great. This attack,
'which spreads down the branches till the main trunk is involved,
'has been described on certain deciduous trees, and is of importance
'as likely to be overlooked.

'Damage by storm, snowfall, frost, or by forest fires, or cater-
'pillar-defoliation, together with careless forestry and the slovenly
'accumulation of loppings, felled timber, and unbarked logs, serve
'to foster the development of such insects, till serious injury is
'risked. The thin-barked Spruce suffers more than the Pine, and
'it was the forests of this tree that were so terribly ravaged by
'bark-beetles in the Harz Mountains during the last century.

'That bark-beetles have been associated with destruction of
'trees over immense areas is undoubted; and it lies with the advo-
'cates of the theory that their presence is immaterial to show what
'those forests would have died from in the absence of bark-beetles,
'instead of invoking mysterious and unnamed "diseases." The most
'serious attempt to prove another cause for the destruction of the
'trees is that of Lindeman, who associated the beetles with the
'presence of *Agaricus melleus*. This, however, appears to be un-
'proved.

'5. Not a few insects feed during some part of their lives
'on or in the young shoots of Conifers, in the leader or the extrem-
'ities of the lateral branches. When the leader perishes, the
'upward growth is checked until one or more branches of the top
'whorl twist round to supply its place. So lateral branches are
'destroyed or have their growth stopped, and the tree becomes

‘altered in shape and appearance. Such mutilated Pines abound in almost all woods in the South of England.

‘6. The practice of growing large pure woods of Conifers of uniform age tends especially to widespread ravages. Most Conifer-feeding insects will not touch deciduous trees, and many are confined to a single species of Conifer. Others, again, limit their attacks almost completely to a single period in the life of a tree. ‘*Curculio abietis* is very destructive to trees under seven years old, comparatively harmless to those of ten or more years. In a pure wood, the conditions favourable to increase of an insect pest exist over the whole area at once, and there is no limit to the supply of food, the facilities for egg-laying or for migration to fresh districts from the part infected.

‘Under these circumstances, a bad insect attack localised in one spot of an extensive forest, is an exceedingly dangerous thing, and it has been necessary on several occasions to isolate such an area in a European forest and destroy it with fire to prevent the hatching of myriads of winged moths which would spread over the neighbourhood. The danger and expense of so drastic a measure are obvious. It is a universal rule that the larger the district cultivated with any particular plant, the greater is the risk of insect-attack, while small isolated plantations become infested with difficulty.....”

In the body of his paper, Mr. Blandford describes what can be done to minimize the damage done by the particular insects he deals with and in conclusion he observes:—“No Conifer-wood can be kept free from the risk of insect-injury, unless it is freed from newly dead and dying wood, cut branches, and fresh stumps. There is no need for the systematic removal of the covering of needles, the natural protection to the ground, nor, as a rule, of small twigs and branches much under an inch in diameter.

‘It is not rarely objected by those anxious to free a wood from insects, that this thorough cleaning is too costly to be put into practice. Without it the insects cannot be kept down, and it is for them to look at the cost of labour and the opportunity for disposal of such timber, and decide whether it is cheaper to let the insects flourish or not.

‘The first cleaning-up of a neglected forest is no doubt costly, but after that has taken place, there is plenty of evidence to show that systematic and orderly removal of dead wood is profitable in the long run, unless exceptional destruction of timber over scattered areas by storms or snowfall should unduly strain the forest resources.

‘No one who is familiar with the pitiable appearance of a Pine-wood thinned out badly by *Myelophilus piniperda* can doubt that in this matter penny-wisdom sometimes leads to pound-foolishness, and that in the end the practice of keeping the forest thoroughly clean—a practice advocated for many generations by scientific foresters—is the best and safest.”

EXPERIMENTS REGARDING THE

Cover of trees reserved in Coppice with Standards.

An extract from a *Bulletin du Ministère de l'Agriculture* recently received, contains the results of numerous experiments made by M. Bartet, *Inspecteur Adjoint des Forêts* at Nancy regarding the Cover of Coppice Standards, by cover being meant the surface formed by the projection of the crown of a tree on the ground. The object of the experiments is to assist in deciding questions which the choice and application of different systems of reserving standards may give rise to. To avoid difficulties, the age of the trees has been completely ignored and in all cases the cover is compared to the diameter of the trunk taken at 1m. 30 above the surface of the ground and the cover is taken as being equal to a circle constructed with the average diameter of the horizontal projection of the crown. This surface has not been actually calculated, the calculations being restricted to determining simply the average diameter of the crown corresponding to each category of trunk diameter.

The method of measurement and the nature and situation of the trees experimented on, comprising some 616 Oak, 169 Beech, and 50 Hornbeam, are explained, and the results obtained tabulated.

The conclusions drawn from figures given in the table for the Oak are *first*, that whatever may be the nature of the soil and the age at which the coppice is exploited, the relation between the diameter of the crown and the diameter of the stem diminishes constantly as the standards increase in girth. *Secondly*, that the lateral development of the crown becomes slower and slower as the trees become old. *Third*, that for trees of a given size the diameter of the crown varies but little with changes in the rotation of the coppice or in the quality of the soil. The figures also show that so far as regards the relative development of the crown and the stem, the Beech and the Hornbeam are regulated by the same laws as the Oak.

The results obtained differ entirely from the theory hitherto adopted in the *Cours de Culture*, a difference arising entirely from the amount of cover allowed by the authors (Lorentz et Parade) for the average tree of each age class. In an example taken for a hectare, the cover obtained according to the *Cours de Culture* is not one half that obtained if the calculations be made according to the table above referred to, a result which will doubtless tend to modify the hitherto accepted principle that the standards in a coppice should not cover more than one-third of the ground immediately before the exploitation.

Influence of altitude on the growth of Forests and Trees.

A most interesting paper is published in the *Allgemeine Forst und Jagd Zeitung* of November, 1892, by Dr. Seiroko Honda of Tokio on his enquiries regarding the influence of the height above the sea level on the growth of forest trees, and their reducing factor.

The enquiries and valuation surveys have been very searching and extended over areas of elevation ranging from 900 to 1050 metres, from 1050 to 1200 metres, from 1200 to 1350, and from 1350 to 1500 metres.

The results of the experiments are shortly summarized showing that with increase of absolute elevation of the locality, the following changes take place in the growth.

A.—THE INDIVIDUAL TREE.

1. The increase in height lessens regularly and distinctly.
2. The basal increase also decreases, but less so than the growth-height.
3. Increase in volume lessens gradually.
4. The stage of immaturity in all these directions is prolonged.
5. The form of the bole becomes less and less cylindrical and approaches more and more the neiloid.
6. The proportion of the increase of the several parts of the tree decreases from the bottom towards the top of the stem.
7. The reducing factor becomes smaller.
8. The crown formation gets lower in proportion to the bole.
9. The proportion of small branch wood increases.

B.—OF THE FOREST.

10. The actual number of stems per area increases, whilst, however—
 11. The number of stouter and dominant trees decreases.
 12. The mean height of the forest decreases.
 13. The total basal area decreases, not very apparently, but belongs to a great extent to trees of inferior growth.
 14. The outturn in timber, scantling and first class wood decreases distinctly.
 15. The outturn in small branch wood increases to some extent.
 16. Trees of the same age are more inclined to form groups
- The article is worthy of perusal and study.

II.—CORRESPONDENCE.

The Departmental Blazer.

SIR,

The subject of a Departmental Blazer seems to have dropped, I hope, only temporarily, for I, for one, would gladly subscribe to the movement and get a blazer when its colour, &c., is decided on. I think the two or three shades of green already suggested by one of your correspondents, will be the most suitable arrangement of colours—three shades for choice and in perpendicular stripes.

YELLI HOITU.

NOTE.—We have been expecting a pattern from "VELLEDA," See August No., p. 308. Would he kindly send it.

HON. ED.

Tiger skins.

Would some of your readers kindly inform me if they have shot tigers with long hair (1 to 2 inches). In Central or Southern India, I don't think the hair ever grows to this length. I have shot upwards of 30 tigers and have been at the death of some 30 more, but none of these had long hair. My reason for asking is because lately I examined two tiger-skins in a furrier's shop and they had hair from 1 to 2 inches all over. And they were priced £ 45 and £ 18 !

The former was for a very fine large skin beautifully marked. The shopman said the skin of a Bengal tiger would cost £ 8 or £10, but he had not any on stock : those he showed me, came from North China (?)

DUBLIN,

E. D.

December, 1892.

The recent Bombay Rules.

SIR,

The rules concerning the relations of Forest and Revenue Officers in the Bombay Presidency, which were published in page xcvi of the October Number of your Journal indicate such radical changes of *régime*, and are withal so complicated on account of saving clauses which modify, or wholly annul other clauses of the rules, that it may not be inopportune to attempt a statement of the net results. With your permission, I will therefore, show, by means of parallel columns, the principal changes effected according to my interpretation of the rules, so far as I feel able to define them, but it will be found that some require explanation by their authors :—

Old Rules

1. The Conservator is responsible for the management of the forests of his Circle.

2. The posting of Superior Executive Officers rests with Conservators.

3. The appointment of inferior officers rests with the Divisional Officer subject to the control of the Conservator.

4. The Conservator is Head of the Forest Department in his Circle, but correspondence between him and Government, affecting the general administration of the district shall be sent through the Commissioner.

5. All correspondence between the Conservator and the Divisional Officer, affecting the general administration of the district shall be sent through the Collector. The Collector shall not issue orders to the Divisional Officers except in emergent cases.

6. The Divisional Officer subject to the Control of the Conservator, is responsible for the technical working of the forests of his Division.

New Rules

1. The Collector, subject to the control of the Commissioner, is responsible for the management of the forests in his Collectorate (Rules 2, 7, 12, 13, 14, 18, 22, 27).

2. The posting of Superior Executive Officers rests with the Conservator subject to the veto of the Collector (Rules 5, 7). It, therefore, may be said to rest with the Collector.

3. The appointment of inferior officers rests with the Collector (Rule 6).

4. The Commissioner is Head of the Forest Department in his Division, and shall settle all forest questions on which he does not consider the opinion of Government necessary; interpret Government orders; and issue orders accordingly to Collectors and Conservators (Rules 1, 28).

5. All correspondence, without exception, between Divisional Officers and Conservators shall go through the Collectors. On the other hand the Collector shall issue such orders as he thinks fit to the Divisional Officer; his correspondence with the Divisional Officer shall be direct and not communicated to the Conservator, and in forwarding the latter's letters to the Divisional Officer, he shall issue such orders as he thinks fit on the subject of the correspondence, without interfering with purely technical details (Rule 10.)

6. The Divisional Officer, subject to the Control of the Collector, is responsible for the technical works of the forests (Rules 9, 12, 13, 14).

Old Rules

7. The Examination of Executive Officers' offices shall be conducted by the Divisional Officer alone.

New Rules

Obviously the Conservator could not be held responsible for the non-fulfilment of technical works obstructed by the Collector. It is necessary to note here that with regard to the above rules 5 and 6 which seem to clash, that although an undefined current of responsibility of the Conservator in regard to "technical matters" pervades the rules, it is quite impossible in many cases to say with whom the responsibility really lies. Rule 4, taken alone, throws responsibility, generally, on the Conservator. But the principal proposition in rule 4 is "subject to the other provisions of these rules"; consequently, rule 13, for example, would efface rule 4 so far as the (pretty wide) scope is concerned, the general tendency of the rules being, however, to throw all responsibility, or as much as possible, on the Collector. I take it that he alone will be practically responsible for the proper management in all its forms of the forests, although it must be admitted that a more definite statement of the Collector's, or Conservator's, functions in this respect is desirable. Here another difficulty crops up: it appears to be impossible to draw a line between the technical and the non-technical! One is sometimes merged in or overlaps, the other; and separate responsibility in regard to the two functions will be found to represent many difficulties in practice. *Under the circumstances*, the only clear way out of the difficulty seems to be to give the Collector, in precise terms, free hand in all matters technical or non-technical, and to make the Conservators functions purely consultative.

7. The examination of the Executive Officer's offices shall be conducted by the Collector and his Assistants (Rule 18. No reference is made to inspections by the Divisional Officer, and it is not, therefore, apparent from these rules whether he shall also conduct examinations or not. Nor is it stated what is to happen after the examinations by the Collector and his Assistants. Presumably, they will merely record notes on the results of their labours for the information of the Divisional Officer, because the sections of the Forest Code, under which it is the duty of the Divisional Officer to examine the offices of his subordinates, apparently still remain in force, and it would cause confusion if several were to be allowed to issue orders to a subordinate on the same subject.

PUZZLED.

III.—OFFICIAL PAPERS & INTELLIGENCE.

Stamps on Forest School Students' agreement bonds.

The following order has recently been issued by Government. "In exercise of the powers conferred by Section 8, of the Indian Stamp Act (I of 1879), the Governor-General in Council is pleased to remit the duties payable on the agreements and security Bonds required to be executed, under the Rules to regulate appointments and promotions in the Provincial Forest Service, by students and their sureties previous to entry into the Forest School, Dehra Dûn."

Allotment to Provinces of newly arrived Forest Officers.

A recent despatch of the Secretary of State has laid down that in future Regulations it is to be settled that Forest Officers on passing out of Coopers Hill are to be "posted at the discretion of the Secretary of State after consulting the President of the College and the Principal Professor of Forestry, to the several Provinces according to the needs of the public service." The new rule will not come into force until the Entrance Examination of 1894.

Forest Works in the Madura District, Madras.

By the kindness of the Madras Revenue Board we have received a copy of the Conservator's recent inspection note on this District and the discussion on it. We do not propose to enter into the controversial questions of which there are many, except to remark that the system in which the Conservator and Collector both have their say and the Board decides, is a much better one than what is likely to result from the recent Bombay Rules.

The most interesting item, perhaps, is that regarding the erection in the Alagar Malai Reserve of a wire rope along which firewood is run down. The Conservator says that the wire rope is about 900 feet long which gives an incline of about 1 in 6. The Collector adds that since the Conservator's visit, the rope has worked very successfully, and as much as $37\frac{1}{2}$ maunds have been run down in an hour. The wire-rope is only $\frac{3}{8}$ inch thick and has broken twice. We should much like to hear more of this experiment and hope Mr. Gass will favour us with an account of it.

In regard to grazing, we are glad to see that the Collector approves of a distinction being made between cattle used for agriculture and others.

Although in one or two instances he disagrees with the Conservator, as, of course, must be expected sometimes, it is clear that the Collector, Mr. E. Turner, takes much interest in Forest work and understands the responsibility which rests with him regarding it.

IV.—REVIEWS.

Progress Report of Forest Conservancy in Ceylon for 1891.

Our Review of the Report for 1890 was printed in the February, 1892, No. of this Journal. The Report of the year 1891 is rather more intelligible as regards the names of trees, for the scientific names are occasionally given.

The area of Reserved Forest was slightly increased, but progress is slow and as the Conservator grimly remarks "at the present rate it will take some 400 years to reserve the valuable forests of the Island if they still exist by that time." The reason seems to be that Settlement Officers are appointed but they do nothing. In one case, however, a Settlement Officer did do a little work and the result is best given in the Conservator's own words. We wonder what the Bombay Government would say to such outspoken criticism!

"One of them, however, which was forwarded for my information, showed that the Forest Settlement Officer did not limit himself to the strictly legal question of admitting or rejecting claims, but that he allowed certain villagers rights to which no claim had been raised, merely because some day the want might arise, not because from personal inquiry he found the right to have previously existed. I hardly think it is the duty of a Forest Settlement Officer to become a philanthropist towards a small

'section of the community at the expense of the public at large. In the instance quoted, little harm has been done, but I think it is a very dangerous precedent.'

Enumeration Surveys towards Working Plans have been made in several Districts and the results are given in the Report. In the Trincomalee District a valuation made at Kiripangankulam over 72 acres, gave 3 ebony, 5 satinwood, and about 28 other trees per acre on an average; while in the Northern Provinces a similar survey found only 18 trees per acre, of which 8 satinwood, and 3 ebony. The Conservator remarks that if the latter valuation is a good sample of a fairly good forest, it helps to explain why forest work in Ceylon is so expensive as compared with that in India and shews that far larger areas are required to maintain the same supply.

The following extract regarding the relations between the Revenue and Forest officers will interest our Bombay subscribers and shew them that their grievances find their counterpart, to some extent also, in Ceylon. We feel sure that the difficulties will disappear by degrees with tact and management.

"In six of the Provinces the dealings between Government Agents and the Assistant Conservators have, on the whole, been satisfactory, notwithstanding occasional friction. The Government Agents consider the Assistant Conservators as their Assistants in Forest matters, and entrust them largely with the Forest administration of their respective Provinces. Where this co-operation exists, the administration is by far the most successful; and the headmen, knowing that the Forest Officers have the Government Agent's support, are much more willing to help them. The Eastern Province and Sabaragamuwa can be quoted as examples in point. On the other hand, in the Western and Northern Provinces, there is no such co-operation. The Government Agents give orders to subordinates without referring to the Assistant Conservators, who are in some cases left in ignorance of forest work which has been carried out, and of expenditure disbursed during the year. This has, in the case of the Western Province, led to confusion in the accounts and to an expenditure larger than the vote allotted. In the Central Province, the Government Agent declined to have any responsibility with respect to forest business, and as I received no orders from Government to take over the responsibility, the Assistant Conservator was more or less independent of all control."

The damage done by fires lit, as usual, by graziers to obtain fresh grass, is reported to be rather serious because the results are that the trees at the edges of the forest 'sholas' get burned and the grass area extends every year. This used to happen and may still happen in places in the Nilgiris but there the extension of a grass fire to the sholas is prevented by the simple expedient of stripping off the turf in a belt around the shola some ten feet broad. We commend that idea to the Ceylon Foresters, but their grass may be stronger and taller than that of the Blue mountains.

Most of the valuable trees appear to have seeded well, the *Halmilla* (*Berrya Ammonilla*) especially so. The Conservator recommends preparatory fellings of a fairly heavy character in order to encourage the natural reproduction of most of the best kinds. It seems that *Na* (*Mesua ferrea*) prefers to germinate in shade as do the *Dún* trees (species of *Doona*) and *Halmilla*, while satinwood and ebony require light.

A considerable amount of planting work seems to be done in Ceylon, and in such a country, where forest conservancy has only come late and the old forests have been found nearly ruined, a large amount of work in artificial reproduction is probably necessary. As in the Nilgiris, so in the Ceylon hills, the Australian Eucalypti and Acacias have been found the most profitable of fuel trees: while in the plains districts attention has chiefly been devoted to the rearing of Teak. During the year, 475½ acres were added to the Ceylon plantations and it is creditable that most of them are recognised as successes. We note a new system of rearing teak seedlings thus described—"The seed was spread in trenches 2 in. deep and watered constantly. After seven days it commenced to germinate, the number of sterile seeds proved to be very small; but we are not told what was done with the seedlings, whether they were pricked out into beds or put in baskets or what.

Of works of utilization, the chief were the erection of a saw-mill at Batticaloa and of two wire-shoots each of a quarter of a mile, in the Central Province, for the Extraction of Railway fuel.

The financial results of the year were

				Rs.
Revenue	...	...	...	4,10,035
Expenditure	...	...	...	4,41,205
			Deficit	31,170

A deficit, which, in a comparatively poor Colony, must be rather serious. Various reasons are given for it, but clearly it is due to the large expenditure on preliminary works and it is apparently expected to be early recouped. In 1890, it will be remembered, the surplus was Rs. 88,528.

We will conclude with a short extract regarding the issue of licenses for shooting elephants which will greatly amuse some of our sporting readers:—

"There has been a great deal of grumbling on account of the license for shooting elephants being raised to Rs. 100. I cannot see much cause for this grumbling. To a person who has never shot an elephant and who is desirous of killing one, an elephant should be well worth Rs. 100, and an animal of this kind should satisfy most men. Those who are not satisfied, should, if they are not willing to pay the money, confine themselves to prescribed rogues, which the Government Agents will gladly allow them to kill without paying for licenses."

Timber Physics.

We have received a printed copy of the first of a series of bulletins on Timber Physics compiled by Mr. B. E. Fernow, Chief of the Forestry Division, U. S. Department of Agriculture, which has been published by the authority of the Secretary of Agriculture. The object of the bulletins is to record the results of an extensive investigation into the nature of the important woods of the United States, especially their mechanical and technical properties and the dependence of these upon structure and physical condition and upon the conditions under which the wood was grown. The bulletin now under reference is preliminary in its nature, being intended to serve as a basis for the work which is to follow and is partly begun.

The first part of the memorandum is devoted to the "Need of the investigation." Mr. Fernow points out that the properties of the various timbers are not well-known and that while attempts more or less systematic have been made to determine these properties there does not exist much reliable published information for general use. Several instances are given of the waste of valuable material which has resulted from this ignorance; for instance the employment of fine black walnut timber for fence rails, posts and firewood; again until twelve or fifteen years ago many million feet of hemlock (*Abies canadensis*) were left to rot in the woods after the bark had been taken for tanning purposes, or this timber was not cut at all, because its value for building purposes was not understood or was underrated. Another instance is given of how, in Alabama alone, an annual saving of \$40,000 to \$50,000 has been effected by utilizing the wood of the chestnut oak for sleepers on the Louisville and Nashville Railroad, a large amount of which wood was a few years ago allowed to rot, the tree being felled for the tan bark alone.

Mr. Fernow states that it would be impossible to estimate the direct and indirect losses which the country suffers from ignorance as to the true values and strength of its building timbers. A *résumé* of some hundred letters received from leading engineers, scientific societies and others, is appended to his report, which, while strongly favouring the thorough investigation of the U. S. timbers, are of interest also as showing the multiplicity of directions in which the work would be of benefit.

The investigation known under the name of "Government Timber Tests," which is to be the most comprehensive of the kind ever undertaken anywhere in the U. S. or in Europe, is stated to

differ from all former attempts in that direction, in that it starts out with the fullest recognition of three facts.

“(1). That in order to establish reliable data as to mechanical properties of our timbers, it is necessary to make a very large number of tests by which the range as well as average capabilities of the species is determined.

“(2). That in order to enable us to make the most efficient practical application of the data thus obtained, it is necessary to know the physical and structural conditions of the test material and bring these into relation with the best results.

“(3). That in order further to deduce laws of relation between mechanical properties and the physical and structural condition as well as the conditions under which the material was produced, it is necessary to work on material the history of which is thoroughly known.”

After certain remarks on the necessity of making the tests on a large number of specimens of known origin and known physical condition, Mr. Fernow adds “While some experiments would lead us to believe that specific weight is a fair expression of the strength of timber of the same species, yet it would be hazardous to rely upon this factor without regard to other physical conditions and structural features of the timber.”

Such ring-porous woods as the oaks and ash show the greatest strength and elasticity when their annual rings are wide, while the slow-grown mountain oak seems to excel in stiffness. From conifers, on the other hand, according to Hartig, the slow-grown timbers seem to exhibit superior quality; hence those from rich soils are not desirable. This again has appeared doubtful or, at least, true only within unknown limits from Bauschinger's experiments which showed that tensile strength in pines was independent of the total width of the annual ring but dependent on the ratio between the spring wood and summer wood. That wet soil produces brittle, dry or fresh soil tough, timber, is believed, but needs proof. Contrary to general opinion, the time of felling seems to be without influence on the strength of pines. The degree of seasoning on the other hand seems to increase the strength, although it would still have to be found out whether the manner and rapidity of seasoning may not change this result. Toughness or capacity for bending without rupture on the contrary, is claimed to be inversely proportionate to seasoning.

The second part of the memorandum treats of the scope and historical development of the science of “Timber Physics,” the subject matter comprised in this branch of applied natural science being arranged as follows :—

I. Wood structure or Xylotomy.

- (a). Exterior form (b) Interior structural appearance
(c) Minute anatomy or histology, (d) Classification of woods according to structural features.
(e) Laws of wood growth (f) Abnormal formations.
- II. Physical properties.
 - (a). Exterior appearance, (b) Material condition (c) Classification of woods according to such physical properties as determine their application in the arts.
- III. Chemical properties.
 - (a). General chemical analysis of wood (b) Carbohydrates of the wood (c) Extractive materials (d) Antiseptic materials (e) Mineral constituents.
- IV. Mechanical properties.
 - (a). Form changes without destruction of cohesion.
 - (b). Form changes with destruction of cohesion.
- V. Technical properties.
- VI. Diseases and faults.
- VII. Relation of properties to each other.

The history of previous works carried out in this connection is then given and the third part of the memorandum devoted to the "Organization and methods of the Timber Examinations in the Division of Forestry."

The work, as at present organized, is carried out by four departments *viz* :—

1. The collecting department.
2. The department of mechanical tests.
3. The department of physical and microscopic examination of the test material.
4. The department of compilation and final discussion of results.

The bulletin concludes with a description of the different methods employed in carrying out the various experiments; instructions for the collection, &c., of test pieces, blank forms and illustrative records and finally drawings of the machinery, &c. required for carrying out the experiments.

V.-SHIKAR.

The Nepal Khedda on the Ganges.

With the permission of Government, the elephants of the Nepal Khedda, under the orders of the Superintendent, Major Jeet Singh Bahadur, have been permitted to march from the Nepal territory along the foot of the Himalaya in order to try and capture some of the wild elephants which are to be found in the forests of the Dún and in those on the left bank of the Ganges opposite. Accordingly, for the past two or three weeks, the whole party with no less than 275 elephants of all sizes have been camped at Chila close to Hurdwar and engaged in the endeavour to catch such herds and single elephants as were heard of in the neighbourhood. The camp was an enormous one, and a very strange sight, some of the elephants being splendid animals. Two, notably, were of enormous size and very powerful brutes, the biggest of all being a huge tusker named 'Narain Gaj.' In order to assist the Superintendent in his work, Mr. F. A. Leete, Assistant Conservator of Forests, was placed on special duty, and he has been good enough to inform us of the results to date. They have not been very successful, only ten elephants in all having been caught so far. Of these, one small calf was allowed to go and also one very old and quite useless animal; while one other has died since capture. This reduces the spoil to ten. No captures were made in the Dún, though there was a curious incident which we describe in Mr. Leete's own words. "On the 31st, the Khedda crossed into the Motichur after the Bagh Rau rogue, found him, chased him and surrounded him; but he showed fight and so 'Narain Gaj' was brought up against him. 'Narain Gaj', however, did not stop soon enough, for he knocked the life, as well as the spirit, out of the tusker. The latter was knocked over and died on the spot and he is there now (all but his single tusk) if jackals, &c., have not found him." This will be a disappointment to the Ex-Amir of Cabul, for the rogue had been proclaimed and Yakub Khan had obtained permission to shoot him.

Another single tusk rogue had previously been captured with some trouble near Chila. The Khedda camp will not now come west of the Ganges, but they still expect to get some good sport towards Haldukhata.

VI-EXTRACTS, NOTES AND QUERIES.

The best Engine for a Saw-Mill.

M. POWIS BALE, M. INST. M. E.

Almost every type of engine is made to do duty in a saw-mill, and as many of them are utterly unsuited to the work, the result is often anything but satisfactory both on the score of economy and effective working.

Owing to the severe and variable duty required of a saw-mill engine, it should be of especially strong and substantial construction, and able to command a uniform speed under suddenly applied loads.

After a lengthened experience, the author is of opinion that the best form of engine for driving wood-working machinery—except under special circumstances—is a long stroke horizontal high pressure, either compounded or with a condenser, or both. Some years ago, the author, in writing on some points to be desired in a saw-mill engine, mentioned the following, and as his views in this respect have not altered, it may not be out of place to repeat them.

(1) A stroke of twice the diameter of the cylinder ; (2) either compounded or with a condenser, or both ; (3) or an automatic expansion slide, controlled by powerful and sensitive governor gear ; (4) a steam-jacketted and lagged cylinder ; (5) short steam ways ; (6) ample bearing surfaces, well fitted and lubricated, and an efficient method of packing ; (7) large cylinder area per h. p. ; (8) a fly-wheel of large diameter and extra heavy section ; (9) a moderate piston speed.

Speaking generally, in selecting an engine, the chief points to be borne in mind are:—(1) The nature of the work it has to do ; (2) the speed and power required ; (3) the cost of fuel ; and (4) if under skilled management. In a saw-mill, if the fuel be plentiful, and the management unskilled, as is often the case in isolated countries, a plain slide-valve engine would possibly suit better than a first-class one with expansion gear, condenser, &c., the loss of fuel being partly compensated for by the greater freedom from breakdowns. In this case, the engine should be arranged to cut off steam tolerably early and expand it for the rest of the stroke, and powerful governor gear should be employed. On the other hand, in establishments where large power is required and skilled management is attainable, the most advanced form of engine is in the end by far the cheapest. In cases where fuel is dear, a good

compound condensing engine can be used with advantage ; but it cannot be too often repeated that, where extreme economy is required, a skilled engine driver is an absolute necessity. If the steam pressure by which an engine is worked would be likely to vary considerably, and the load likewise vary ; to secure steady and even running, the engine should be fitted with valve gear having a considerable range of cut-off, combined with a powerful and sensitive governor.

In selecting an engine, a full detailed specification, giving sizes and materials, should be obtained from the maker, with his guarantee as to horse-power—brake horse-power, if possible—the engine will give out at a certain steam pressure, and that it will work at its full speed and power without excessive vibration.

See that the bed-plate and frame and working details of the engine are of ample strength, also that the cylinder has sufficient metal to allow of its being rebores several times, that the steam passages are short, that the sliding and bearing surfaces are ample, and that they are adjustable for wear. The author prefers a medium piston speed—say 500 ft. per minute, to higher speeds, as he has found the cylinders of large horizontal engines run at high speeds rapidly wear hollow.

An engine of ample, but not excessive, power, for the work to be done, should be selected, as too large an engine is as wasteful of steam as too small a one.

For saw-mill work, the author prefers the bed-plate of the engine to be on the double girder box plan, and to extend beyond the cylinder, which should be mounted on it, as this is undoubtedly the best form to resist heavy working strains. If a pair of engines are used, it will be found well to have one large fly wheel for the two engines, placing it between them, with an extra pulley for driving the main shafting. Crankshaft to be fitted with an outside bearing. Connecting rod ends to be made adjustable for wear, and fitted with straps and keys. Engine to be fitted with wide double motion bars and blocks, and made adjustable for wear. The bars should have oil recesses and grit cavities. Stop and starting valve to be provided and so arranged that access can be had to the throttle valve without disturbing the steam pipe. The steam passages should be large, short, and direct, and the clearance in cylinder as small as possible.

For driving woodworking machinery, after repeated trials, I am distinctly in favour of an engine with a long stroke, as it permits a higher piston speed without excessive vibration and wear and tear, and the steam can be expanded with greater facility. The steam ports should be as short as possible. This can be secured by dividing the slide valves, placing them at each end of the steam chest ; and a high-speed sensitive governor should be arranged to act on an equilibrium double-beat throttle valve, or on expansion gear. The exhaust should be of ample size, to admit of the instant

escape of the steam and avoid back pressure. In crowded spaces it is sometimes necessary to use a vertical engine; these can be compounded with advantage, and although necessarily of shorter stroke, they can be worked with less wear to the piston, cylinder, glands, &c., than a horizontal engine, the wear being distributed, whilst in a horizontal engine the cylinder wears oval.

Arrangements should be made for the continuous drainage of the cylinder, and it should be fitted with a good sight feed lubricator, which is a distinct improvement over ordinary grease cups, as with these latter the piston may be running perfectly dry, and the cylinder may be scored and the rings cut out before the attendant is aware of it. A very considerable economy in oil is also effected by the use of a sight-feed lubricator as it can be adjusted to supply the minimum amount of oil to keep the cylinder properly lubricated. On the other hand, the old-fashioned grease cup floods the cylinder with oil for a short time, and, this being rapidly cleared away by the strokes of the piston, the cylinder is left comparatively dry in a little time.

Compound engines have of late years come considerably into use, and are more economical than single cylinder engines. This arises chiefly from the fact that much higher pressures of steam can be expanded with greater advantage in two cylinders than in one, and without the considerable loss from condensation which arises in a single cylinder when the steam is cut off very early in the stroke. Again, if a considerable range of expansion be attempted in a single cylinder, and the cut-off is very early, the strain on the working parts is great, necessitating excessive weight and strength in the engine. In the case of compound cylinders, however, this strain is distributed.

In single cylinders, if large expansion be attempted, the steam condensation is excessive and becomes a serious matter. Compound engines will work more steadily and with less friction and vibration, consequently the general details of the engines may be made lighter. Where a sufficiency of water is obtainable, a condenser can be fitted to an engine with considerable advantage, as in this case, instead of being exhausted into the open air or water tank after each stroke of the piston, the steam passes through the exhaust port into the condenser, and, coming in contact with the water, which is in constant circulation therein, is itself immediately condensed or reduced to water. In working the condenser, an air pump is employed, which keeps up a vacuum and relieves the piston from back pressure, thus increasing the effective power of the engine. The water made hot by the condensation of the steam is again used to feed the boiler, hence a second saving arises.

A simple and convenient arrangement for working the air-pump for a condenser is to prolong the engine piston-rod through the back cylinder cover. The air-pump should be double acting, and the valves arranged so as to give ready access for adjustment and repairs. The engine-bed should be prolonged and

the condenser mounted on it, so as to secure perfect alignment. The author has found pump valves of indiarubber, with gun metal seats, guards, and bolts, work very well. If there is no overhead tank for the injection water, sluice valves will be found most useful for starting the engine.

Automatic expansion gear is especially useful in a saw-mill, and with varying loads effects a considerable saving, as the admission of the steam is regulated according to the speed or load on the engine. The gears of Corlis & Proel have proved themselves very effective.

Another advantage arising from the use of automatic expansion gear is that the steam is always delivered to the cylinder at the highest available pressure, whilst in the case of an ordinary slide valve engine where the cut-off of the valve is always positive, the admission of the steam is governed by means of a throttle valve the action of which "wire draws," and reduces the pressure of the steam. With efficient expansion gear the amount of steam required to do the work on hand at the moment is practically measured at every stroke of the engine, and no more is used than is required, and this in turn is fully exhausted of its energy by expansion.

Owing to the constant and great variation of the load in a saw-mill, it is important that a governor be fitted sufficiently powerful to keep the engine perfectly under control, and the speed uniform. Various forms of high speed governor have come into use, and several of these have proved themselves both sensitive and quiet in action, and are to be preferred to the older-fashioned type.

Another very satisfactory arrangement of automatic expansion gear is the Ruston. In this the cut-off valve is made multiple ported to give free admission of the steam, and is driven by a radius rod, the free end of which is moved up or down in an oscillating slot-link, which is driven by a separate eccentric, the precise position of the rod being determined by the governor. As the speed of the engine increases and the governor balls rise, the travel of the expansion valve is reduced, and the steam is cut off earlier; should the engine run more slowly, the contrary occurs. The range of cut-off is from a fraction up to half a stroke.

For the guidance of readers, I append a specification of a high-class engine, well adapted for saw-mill work:—One improved horizontal compound tandem condensing engine to indicate 340 horse-power mounted on double girder box plate, planed on face; high pressure cylinder, 18 in. diameter; low pressure cylinder, 34 in. diameter; stroke of pistons, 36 in.; number of revolutions per minute, 90; diameter of vertical air pump, 20 in.; stroke of vertical air pump, 18 in.; diameter of horizontal air pump, 14 in.; diameter of crank shaft, 10 in.; made of best fagotted scrap iron; diameter of fly-wheel, 18 ft.; width of face of fly-wheel, 28 in.; diameter of stop valve on high pressure cylinder, 5 in.

To be fitted with Corliss' Variable Expansion Gear, on high-pressure cylinder, and ordinary slide valve on low-pressure cylinder. The cylinder to be made of best hard cold blast iron, to be steam jacketted, and with steam chest to be fitted and lagged. Connecting rod, slide and pump rods, to be of best faggotted scrap iron, and the piston rod, pins, keys, &c., of steel. All pins, joints, &c., subject to special wear, to be case hardened. Valves and plunger of pump to be of gun metal. All journal bearings to be of best gun metal or phosphor bronze, to be made adjustable for wear and efficient means of lubrication to be secured. An efficient sight feed lubricator to be fitted to steam cylinder, eccentric straps to be of gun metal, and made adjustable for wear. The whole to be finished to the satisfaction of Mr.———,

In conclusion, I may add :—Do not be persuaded into purchasing a low priced engine or boiler under any circumstances, as you may rest assured that it is impossible to purchase a first-class equipment at the price of a common one. The loss sustained in a day by using a poor engine and boiler may not be great, but this, multiplied by a series of years, may amount to an enormous sum ; in fact, in some cases, enough to buy a first-class plant several times over.—(*Timber Trades Journal.*)

Edinburgh University Forestry Lectures.

The introductory lecture to the Course on Forestry in the Edinburgh University was delivered recently by Colonel Bailey in the Agricultural Classroom. Among those present were Professor Bayley-Balfour, Professor Wallace. Dr. Cleghorn, of Stravithie, Colonel Dodds, &c.

Colonel Bailey said that originally it was intended to complete the entire series of about one hundred lectures before the close of the winter season ; but, after consulting several gentlemen well qualified to offer an opinion on the question, he had decided to ask the permission of the University Court to divide his course into two parts. The first part would deal with forest botany, or the structure and growth of trees ; and the second part with silviculture, comprised under which would be the habits of trees and their behaviour under the influence of heat, light, moisture, climate, various classes of soil, &c., the more important silviculture systems under which trees were grown in masses, and the creation and treatment of woods under these systems. These two subjects would occupy the winter season, and the other subjects—such as mensuration and valuation ; working plans, or the organisation of woods in such a manner that they might best fulfil the objects for which they were maintained ; forest pathology, or the diseases of trees and their treatment ; and the utilisation of forest produce—would be taken up during the summer, when opportunities for making excursion

were greater than during the winter season. The new arrangement would have this advantage also, that if he could alternate the first and second parts in such a way that the second part might be taken first next year, and the first part second the year after, and so on, a student would be able to follow the whole course, either in a single year or in two consecutive winters or two consecutive summers. Colonel Bailey then explained further the nature of the course—mentioning that he meant to use Dr. Schlich's "Manual of Forestry" in dealing with the general part of silviculture. He had been told, regarding books originating elsewhere than in the United Kingdom, that it was sometimes objected that they taught "Continental forestry," which did not apply to this country. But he did not recognise Continental, Scottish, or any other special kind of forestry. The principles which should guide the forester were the same all over the world, and these were what he proposed to set forth in that part of the course. He was aware that there were some excellent books on the subject by Scottish authors, but these would have greater value in the special part of the course rather than in the general part of which he was now speaking. The more their eyes were opened by a study of the general principles on which the science of forestry was based, the better they would be able to appreciate the special conditions with which they had to deal and the sooner they would be able to assist in building up, for the treatment of each species of tree flourishing in this country, a complete system which could be unhesitatingly accepted by their successors as one which rested on a solid foundation of recorded facts to the observation of which they would be guided by the researches conducted by the most eminent foresters the world had produced. In concluding, Colonel Bailey said he might mention a document that recently came into his hands, viz., the Board of Agriculture's building specification, which did not permit the use of Scottish timber in agricultural buildings without special permission. It permitted the use of Canadian, Norwegian, and American timber, but not Scottish timber, without special permission. That seemed to him to be a slur on the proprietors and forests of this country. He was in correspondence a short time ago with a proprietor in the North, who said to him, "What is the use of our learning forestry in this country? Here we are prohibited by the Board of Agriculture from using Scottish timber for building purposes." He (Colonel Bailey) wrote back to him and said that "if there is any such provision it must be because you grow bad timber. I do not believe the Board of Agriculture desires to prevent the use of good timber." He (Colonel Bailey) got the specification, and there he found it stated that Scottish timber could not be used without special permission, and that that should only be accorded by the inspectors when it was sound and seasoned, showing that the experience of the Board of Agriculture had been that proprietors were in the habit of using timber of a bad sort. What he (Colonel Bailey) would like to see established would be such a mode of wood

management in this country that the Board of Agriculture should revise that specification and should strike out this evil and, he would venture to say, insulting clause. (Applause). He perhaps would not give offence if he added a few remarks on the extraordinary ignorance which seemed to prevail regarding this matter of forestry. It was his belief that very few people outside of what he might call the "magic ring" realised that there was anything in it. A man who lived in the country and had seen trees as he walked, perhaps, to and from church, fancied he knew all about them. He fancied that Professor Bayley-Balfour, and Professor Wallace, and some others in the room could tell them a different story. He ventured to think it was a very wide and a very abstract science, that required deep study and that involved a knowledge of several cognate sciences. He hoped the time was not far distant when they would find that the people of this country were as thoroughly acquainted with the general facts of the question as he knew they were in France and Germany.—(*Timber Trades Journal*.)

Burmese Amber.

Dr. Otto Helm, of Danzig, has submitted the following report on a piece of Burmese amber. He writes ;—Dr. Fritz Noetling, under orders of the Director of the Geological Survey of India, has sent me a piece of amber-like resin from Upper Burmah. I have, as far as the small quantity of material would permit, made a chemical and physical examination of the specimen, and I hope to follow the publication of this preliminary investigation with a further contribution.

The fragment under examination is covered with a thin weathered crust of a brown colour. When broken it exhibits a shining, conchoidal fracture, with a greasy touch. The internal colour is dark yellow, some parts being transparent, and others sub-transparent, the latter being beclouded with organic matter, finely disseminated through the substance of the resin. The specimen exhibits a fine blue fluorescence. If light be sent into the interior with a convex glass lens, the cone of light appears of a golden yellow colour. In polarised light, the same colour is exhibited, changing, however, by revolution of the Nicols through 90° to blue and orange.

The resin is as easy to cut, saw and polish as the Baltic amber (Succinite) ; it is a little harder, however, than the latter, its hardness varying between 1·5 and 3.

Its specific gravity is 1·034.

As to the chemical constituents of this fossil resin, I am not yet able to give an ultimate analysis, as the piece in my possession

exhibits no portion of perfectly clear colour, but is clouded throughout by finely disseminated particles. I have, nevertheless, made a dry distillation of the resin, and the results are extraordinarily interesting and different from those which other fossil resins give under like conditions. During the distillation, for which I used a glass retort, there first appeared a white vapour cloud, which, on cooling, condensed to water-white drops; subsequently the vapour became tinged with yellow and condensed in thin oily streaks; ultimately, the cloud was dissipated and thick oily drops flowed into the receiver. The distillate is a brownish yellow oil, with tarry consistency, of a peculiar burnt smell and an extremely small quantity of a watery liquid. I treated this liquid with hot water and filtered: it was water-white, and gave an acid reaction with litmus paper. On repeated distillation over a steam bath, a liquid distilled over and a yellowish residue remained behind which I cleaned by solution in water with subsequent filtration and evaporation. The small quantity of crystals thus obtained I recognised, by well-known reactions, to be pyrogallie acid, whilst the aqueous distillate contained formic acid. Succinic acid was not found in the products of distillation.

The resin contained 0.6 per cent of ash which was composed of iron-oxide, sulphuric acid, carbonic acid, and lime. I found a very small quantity (0.013 per cent.) of sulphur in combination with organic substances.

The fusion point of the resin cannot be determined, as before that point is reached it decomposes with evolution of a white aromatic vapour.

The resin proved to be very resistant against solvents:—Chloroform dissolves only 2.2 per cent of it. Alcohol dissolves 0.8 per cent, the solution leaving behind, on drying, a black-brown resin. Ether dissolves 2.4 per cent, the solution leaving, on evaporation, a clear yellow resin. By oil of turpentine 18.5 per cent was dissolved, whilst carbon bisulphide dissolved 4.6 per cent.

If the pulverised material is treated with concentrated sulphuric acid, the resin gradually dissolves, forming a solution of a red-brown colour, which blackens on heating. When the red brown solution is treated with water, a dirty white deposit separates out. Concentrated nitric acid at the ordinary temperature has little effect on the resin, but on heating, the latter is changed into a yellow friable substance.

By friction, the resin becomes electric, and retains its electricity for some time.

From the foregoing investigation, it seems that the Burmese resin differs from all the fossil resins with which I am, up to the present, acquainted; and I shall continue this research as soon as further specimens of clear colour are available. (*Memoirs of the Geological Survey.*)

The Timber trade on the Yangtse.

The British Consul at Hankow noticing a great growth in the timber trade in the great river owing to the decrease in the inland transit dues, says that for many years the high transit duties imposed, amounting often to over 100 per cent., *ad valorem*, checked the trade, which the natural features of the country—steep declines easily formed into timber-shoots and swift torrents capable of floating the timber to navigable streams—should have facilitated, and which the very low charge for labour in the forest regions should have made profitable. Lately, however, these dues have been lightened, and the consequence has been an enormous extension of the timber trade at Hankow. Most of the timber goes down the river in the form of huge rafts. These, with the huts erected on them for the raftsmen, looking like floating islands, are a remarkable feature of the river landscape of the Yangtse; and the floating timber yards where these rafts are lashed together reach for some six miles along the north bank of the Yangtse at Hankow. The value of these rafts must be enormous, but they do not appear in the trade returns for the port. Owing to the increase of both rafts and foreign shipping, collisions were at one time frequent, giving rise to acrimonious and troublesome disputes, which, however, the Consul has now succeeded in obviating by inducing the Chinese to accept certain simple regulations.—(*Weekly Times*).

VII—TIMBER AND PRODUCE TRADE

The Timber trade of 1892.

We quote the following extracts from Messrs Churchill and Sim's Wood Circular of January 2nd 1893 as likely to be of interest to our readers.

The wood trade of the United Kingdom for 1892 has not resulted so satisfactorily for importers as in 1891, although it has been larger in extent. In the last-named year, buyers derived special advantages from continuous rise of prices at the shipping ports, and, in the autumn, from a considerable advance in freights; a combination which necessarily added materially to the selling values of all earlier importations. The trade of 1892 was not favoured in the same way by a constantly increasing cost of supply, but there was nevertheless no reason to complain of a course of free on board markets which continued remarkably steady throughout, while freights, as in the preceding year, rapidly advanced towards the end of the season. On the whole a good year's business may be reported; if not rateably so profitable as that of 1891, the greater volume of it may be expected to have nearly made up the deficiency,

and this seeing the difficulties created by the prevalence of strikes in many of the greatest trades and industries of the country, may be considered as a fortunate outcome.

The following tables, compiled at the Custom House, will show the extent of the trade in recent years in respect both to volume and value ;—

Wood Imported into the United Kingdom in the following years :—

	1885.	1886.	1887.	1888.
Colonial Deals, Battens, &c, ...	995,373	948,349	866,857	921,837
„ Timber and Hardwoods	255,264	159,014	168,751	186,902
Foreign Deals, Battens, and Boards	3,234,944	2,834,851	2,926,820	3,414,197
Foreign Timber and Hardwoods	1,679,397	1,418,978	1,551,598	1,795,347
Colonial and Foreign Staves ...	124,374	130,708	137,410	143,873
Total, in Loads...	6,289,353	5,491,000	5,646,430	5,462,205
Value ...	£14,758,747	£12,135,264	£11,684,953	£14,270,696
	1889.	1890.	1891.	1892.
Colonial Deals, Battens, &c. ...	1,233,750	1,185,205	890,597	1,212,177
„ Timber and Hardwoods	227,229	180,006	151,828	194,654
Foreign Deals, Battens, and Boards	4,085,000	3,593,109	3,487,855	3,881,432
Foreign Timber and Hardwoods	2,182,282	2,098,308	2,099,749	2,274,486
Colonial and Foreign Staves ...	170,155	155,995	130,101	136,063
Total, in Loads...	7,878,396	7,212,653	6,760,130	7,699,512
Value ...	£19,471,566	£16,766,018	£14,479,139	£16,679,525

EAST INDIA TEAK.—The importation of Timber and Planks has been :—

	1886.	1887.	1888.	1889.
And the deliveries	19,000 Loads.	9,100 Loads.	12,270 Loads.	19,407 Loads.
	11,144 „	12,241 „	16,618 „	15,899 „
	1890.	1891.	1892.	
...	16,000 Loads.	16,538 Loads.	7,923 Loads.	
...	17,140 „	14,371 „	10,455 „	

The severe depression prevailing in the shipping trade has had a very prejudicial effect upon the market for this Timber. The chief demand comes from the ship-building yards, but with freights ruling at very unprofitable rates, orders for fresh tonnage have naturally been reduced recently, and consequently, though both supplies and prices have been moderate no signs of life have been seen in the trade, and a serious decrease has taken place in consumption. Planks, on the other hand, owing to cheapness, have been used more freely than before for other purposes than ship-building, and it is fortunate in these bad times that a wider market has been found for them. On the whole, prices have been fairly steady during the year, for which thanks are due entirely to a great decrease in supplies. Prospective supplies likewise promising to be of a moderate character, a slight impetus to demand would quickly alter the position considerably for the better.

EBONY.—CEYLON.—Importers' stocks were cleared early in the year, and it was several months before any fresh supplies came forward, by which time prices had considerably advanced, and for

large, good, wood high figures could have been made; but the import, although small in total quantity, was mostly of a poor character, and therefore only realised low prices. Unsold stocks are now light, and for fresh arrivals of large, sound wood, good prices could be made, but small and poor logs should not be sent, as the market has been too freely supplied with wood of this character from other districts. Quotations are from £6 to £8 for ordinary to fair, and from £10 to £16 per ton for good to prime, large logs. EAST INDIA—was imported very freely during the first half of the year, and as at the same time the demand fell off, prices, which were good at first, soon declined, and it became difficult to effect sales. This description, owing to its inferior colour, has not maintained its position in the trade, and although more sales have been made recently, much lower prices had to be accepted and a considerable stock remains on hand. Quotations are from £5 to £8 per ton.

SATINWOOD, EAST INDIA.—Early in the year logs sold well, but as shipments increased, stocks accumulated, and prices declined, sales becoming difficult as the consumption of this description has never been large. Figury and large logs were generally saleable at fair prices, but for small and faulty wood very low rates had to be accepted. The import was the largest for many years, but it was all sold, and small parcels of really good logs might now be sent. Planks and boards were not shipped, and consignments cannot be recommended, as they are never asked for.

PADOUK.—The demand for this wood considerably increased, and supplies are now needed, as there is no really good wood in stock. Only two cargoes were sent here, and of these but little remained for home consumption, as the bulk was purchased immediately for shipment to the United States. Quotations are—for logs and planks from 2s. 9d. to 3s. 6d., per foot cube.

MARKET RATES OF PRODUCTS.

(*Tropical Agriculturist*, January, 1893.)

Cardamoms	per lb.	2s.	to	2s. 6d.
Croton seeds	per cwt.	15s.	to	20s.
Cutch	"	20s.	to	32s.
Gum Arabic, Madras	"	40s.	to	80s.
Gum Kino	"	100s.	to	120s.
India Rubber, Assam	per lb.	1s. 6d.	to	2s. 1½d.
" Burma	"	1s. 5d.	to	1s. 9d.
Myrabolams, Bombay	per cwt	9s.	to	10s. 6d.
" Jubbulpore	"	8s. 4½d.	to	9s. 6d.
" Godavari	"	8s.	to	9s.
Nux Vomica, good	"	8s.	to	9s. 6d.
Orchella, Ceylon	"	22s.	to	28s.
Redwood	per ton	£3	to	£3-10s.
Sandal wood. logs	"	£35	to	£60
" chips	"	£9	to	£30

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On Forest Settlement and Administration.

It appears from an article in the April 1892 number of the *Indian Forester*, by Mr. Baden-Powell, who has had good opportunities for forming a correct opinion, that the way in which the forests have been settled is, generally speaking, not entirely satisfactory. The same conclusion has, I dare say, been arrived at by others who have had much to do with settlement work. In the earlier days of the Forest Act, the chief object of the settlement officer was, so far as my experience goes,* to "reserve" as much as possible of what he considered really valuable† forest; to "protect" the whole of the remaining waste-lands after leaving a margin for the extension of cultivation; to declare the whole area free of rights; to grant concessions freely all over the protected area; and to keep the reserved area free of all concessions. This mode of procedure enabled the 'settlement' to progress rapidly, as, although some care was deemed necessary in the selection of reserved areas, but little trouble was taken in the selection of the protected areas which was often done in a very summary, haphazard fashion. It also fell in entirely with the view generally held that this was the only mode of selection which would enable villagers to have ample areas of the permanent forest lands from which to help themselves to produce and in which to graze their animals at will. The one advantage of the system, from the forester's point of view, was that it gave to the Forest Department certain areas over which it was intended that the latter should have full control, and over which, as a matter of fact, it was given full control. A disadvantage was that these areas of protected forest, often largely exceeding the reserved areas, were invariably situated in the most frequented and populous parts of the country, in the vicinity of towns, villages and cultivation, and were really far more in need of settlement (in the interests of the surrounding population) than the reserved areas.

*It is scarcely necessary to say that these remarks, as well as those which follow, have reference only to the somewhat limited sphere which has come under my own observation.

† i.e. These areas which were stocked with the biggest and most marketable trees. Other economical matters were not thought of.

At that time, however, the general feeling in the Revenue Department, and to a certain extent also, the feeling in the Forest Department, was against reserving any area which could not be declared free of rights and concessions, and it would have been quite impossible to reserve more than a fraction of the permanent forest area. It was thought that reservation under Chapter II of the Act would give unlimited powers for evil to the Forest Department; and that Reserved Forest should, if only for this reason, be confined as much as possible, if not entirely, to areas that could be reserved free of all rights and concessions. In a great measure owing to these mistaken notions of the object and effect of reserving forests, Revenue Officers were generally at bottom dead against Reserved Forest at all and the oddest thing was that no amount of explanation regarding the aims and consequences of reservation under Chapter II served to disabuse their minds of the conviction that that Chapter had been introduced into the Act, by the Forest Department, with a view to defrauding villagers of their rights, or to convince them that it was in the least degree applicable to forests in the immediate vicinity of inhabited tracts. Even now, many seem to hold mistaken views on the subject: otherwise, it would be impossible to explain the antipathy to reserved forests often manifested in recommendations regarding quite recent settlements.

Of late years there has been a tendency to reserve a proportionately far larger area, and even to convert some of the originally protected areas into reserved, but the control of the reserved, as well as of the protected, is rapidly slipping, or has already slipped, away from the Forest to the Revenue Department. This transfer of authority over areas which it is desired to maintain *permanently* as forest is, I consider, to be regretted. How is it possible to have confidence in the management of a department which has so persistently and so blindly opposed sound settlement and management? In a leading article in the October number of the *Indian Forester*, it is asserted that the constitution of reserved forests in many parts of Madras is ascribable to the co-operation of Revenue Officers consequent on their being given a larger share in the management of forests. But could they help themselves? Had not the *fiat* gone forth that areas intended to be kept permanently under forest should be *settled*? Is not the fact now more generally recognized that reservation and the exercise of rights and concessions are compatible? And has not the Revenue Department been fully compensated by getting complete control—if not nominally, at all events practically—of the forests, into its own hands? But if these reasons are not sufficiently convincing, and it be still maintained, by the writer of that article and his followers, that the reservation of certain areas in Madras is to be ascribed to the cause alleged in the article, that fact would also prove the unfitness of Revenue Officers to deal fairly with forest affairs, since they have, according to the writer of the article, to be bribed to take right action by the concession of a larger share in the management of the forests. I do

not see how men who have neither the requisite training, nor the practical acquaintance with forest affairs necessary for a thorough understanding of forest questions or of agricultural matters connected with forest management, can be expected to deal satisfactorily with forest affairs except by pure chance; but apart from this consideration, their training and surroundings constitute a powerful incentive to act in a way unreasonably harmful to the forests. A special function of Revenue Officers is to look after agricultural interests; and, in all questions in which the farmer is directly or indirectly concerned, he is admittedly represented by the Revenue Officer, who cannot fail to approach these questions with a biassed mind: the two offices of Advocate and Judge cannot be combined. I do not blame him, all I say is that no person so situated is fit to decide between the claims of agriculture, on the one hand, and of forest conservancy and administration on the other. I think it was Sir Richard Temple, who used to talk of "physically educating" Revenue Officers up to a rational and impartial treatment of forest affairs. It would be as reasonable to hope to educate a pack of wolves into guarding a flock of lambs;* education will do much, no doubt, and if the subjects of examination taken up by candidates for the Civil Service of India were such as to develop the faculties and a knowledge of the subjects most necessary for a member of that service, our forests would assuredly receive more rational treatment; and their position in the national economy, as well as their right management, would be more easily appreciated by men whose influence for good or evil is out of all proportion to their knowledge of things and consequently, to their power of drawing correct inferences from what they see.† If some attention were paid to forest and cognate subjects, fewer inter-departmental disagreements would arise on pure matter of fact. Such a

*Not that I would liken Revenue Officers to wolves, but the metaphor expresses the idea intended—you cannot deprive an individual of his natural instincts unless you remove the cause which, in the present case, is, *inter alia*, the championing of the so-called (not always real) interests of agriculture.

†This may appear, at first sight, to be too strong a statement. I have no wish to exaggerate, and I do not think I can be accused of over stating the case. What is the business of a Revenue Officer? Certainly not the study of classics, mathematics, or modern languages, and yet these are the subjects which alone enable the majority of candidates to get into the Civil Service of India. Subjects calculated to develop the best work by a Revenue Officer, to enable him to understand the nature and bearing of many questions with which he comes into daily official contact, and to cultivate the faculties of observation and scientific method, are comparatively neglected; while the sciences of agriculture, engineering, forestry, sanitation, and possibly other matters of the greatest practical value to him, are entirely neglected. No sensible person would ever dream of educating, *à la* Macaulay (I believe he was the man who introduced the present system) a youth intended for the naval profession, or more correctly speaking of educating him on the lines which Macaulay's system has led to; and yet these lines are quite as well suited to the navigator as to the Civil Servant. Things have changed a good deal since the earlier days of the competition-wala; perhaps he was a less ambitious man in those days; at any rate in our day, a purely literary or mathematical education will not suffice for men who aspire to take a leading part in the decision of all the technical questions of the day.

misapprehension of the facts as is involved in the statement, for example, that kumri-cultivation on the precipitous mountain slopes of Southern India is eminently conducive to tree growth, and that therefore, it should be encouraged, would at all events, be impossible, as well as many equally ill-founded statements of a different nature advanced by Revenue Officers in all good faith, in their eagerness to make out a case for what they consider to be the interests of agriculture.

My contention is, then, briefly this, that Revenue Officers as a class, are unfitted by education and by the force of circumstances that surround them, to deal fairly with forest affairs, and that the history of forest administration shows that, as a class, they have steadily opposed the rational treatment of forests. Some of them, at least, virtually admit this. Sir Richard Temple did, and so does Mr. Baden-Powell. The opinion of the latter is the more valuable in that he has had more varied practical experience of forest matters, and has devoted more time to their study, than any other member of his service, past or present. It is worth while, therefore, to give a few extracts from his paper, already referred to, in which he repeatedly accuses Revenue Officers, as a class, of incapacity to regard forest affairs seriously or in their true light. He accuses them of holding the view "that ordinary forest offences do no harm," that "careful forest preservation, 'implying protection against trees, is only needed for a very 'special and limited class of plantation and for valuable teak and other 'first class woods. And it is held that for the great bulk of forests, no 'particular care is needed; and that (of course excepting gross acts 'of destruction) everybody may be left to take wood, grass and 'bark, and to graze cattle freely at all times, and in all places, as he 'pleases; and that, though the forest may not, under such free and 'easy treatment, produce 'gigantic teak trees,' still it will yield, and 'go on yielding, all that is practically necessary." Again, "the 'majority of officers cannot get rid of the idea that no matter how 'numerous or extensive the demands on a forest are, no care is 'needed in periodically closing any part; no unpalatable restrictions 'need be placed on the quantity, or mode of acquiring it, the yield 'will go on for ever, as long as produce is only fairly taken and acts 'of mischief, as distinguished from acts of mere appropriation, are 'repressed. The absolute fallacy of this idea, it is to be feared, will 'not be established, till our forests are experimentally ruined before 'our eyes, if indeed (and here is the misfortune) the ruin, which is 'not less sure because slow, is not delayed beyond the ordinary 'official lifetime of any one officer. To this inveterate belief is, 'unfortunately, to be added, the intense fear of unpopularity and dis-'content." These, then, are, according to Mr. Baden-Powell, some of the obstacles to rational management under existing circumstances, and they are pretty stiff ones, too. Nobody wishes to deny that now and then we come across Revenue Officers who rise superior to their environment and admit the necessity of establishing rational

management in all forests which are considered to be necessary for the welfare of the country, who recognize the facts that must be faced to attain this object, and are prepared to face them. But it is quite natural that a far greater number should, in spite of the facts, take a very different view of the necessities of forest management, and this course is all the easier to the many, who, as pointed out by Mr. Baden-Powell, are incapable of perceiving the disastrous effects that the adoption of views similar to theirs has brought about in the past, nor the evils that the adoption of their policy is destined to bring about in the future. It is, therefore, a misleading and empty phrase to talk of enlisting the sympathies of Revenue Officers. That object could only be attained by smothering their much stronger feelings in the direction of *laissez aller*. Still less is it possible to "enlist the sympathies of the villagers," a much abused phrase of which we hear so much whenever it is desired to abandon scientific management or to grant them unnecessary concessions. Theirs is, even more than that of the Revenue Department, a hand-to-mouth policy, and they naturally treat us as an excellent joke, any suggestion that they should exercise the slightest self denial or even care in order to preserve some of the forest for the use of those who are to come after them, although they may, and often do, recognize well enough the destruction that is going on, and the consequent evils in store for their descendants.

We often hear it said that the Forest Department should have full control of technical matters while the Revenue Department controlled the non-technical. Theoretically, this may appear to be an excellent arrangement, but those who think so, should tell us how it is to be put into practice. Theorists omit this important part of the programme. A few years ago, not quite recently—he has scouted many of his professions since then—Mr. Gladstone said, with reference to Home Rule, that to separate Imperial from Local business 'passed the wit of man.' We may borrow the phrase in the present case, and say that to separate the technical from the non-technical passes the wit of man. Surely this must be obvious in a thousand ways to everybody. Take, for instance, the familiar case of a closure against grazing. The actual prohibition certainly cannot be called a technical affair, but it may be the first and only step in the preparation of the soil for the reception of the seed and the only practicable means to that end and as such would be a technical operation (although the Revenue Officer might not see it) on which the very existence of the forest would depend. Who then is to say what is technical and what is not technical? And yet in all questions regarding the apportionment of control between the two departments, how much stress is apt to be laid on this point, and what tremendous castles in the air are erected on the assumption that the two functions can be sharply defined?

This fact—the impossibility of separating professional from non-professional functions—should therefore, be recognized. Until this is done, and until the principle is generally admitted that

Revenue Officers, as a class, are incapable of holding sound views regarding the management of forests, there can be little hope of lasting progress or of continuity in forest administration as a whole. When these facts are generally admitted, it may be possible to affect a compromise by means of which the Forest Department shall be enabled to fulfil the function for which it was presumably created and to manage its own affairs, or at least to have a predominant voice in the matter. It would be preferable to have a much smaller area well managed than to have the whole of the present area worked in a half-hearted manner which ensures the maintenance of no portion. A further measure which will be found to be necessary will be the appointment of a Forest Officer to each province as Secretary or Joint Secretary to Government in the Forest Department, as suggested (I think) in an article in the *Indian Forester* for October. Excepting the Burmese, no Local Government has a professional adviser attached to the Secretariat, but there can be little doubt that, if continuity in regard to forest affairs is to be ensured, and misunderstandings are to be avoided, a measure of this kind will be found to be necessary.

One word more before concluding. This paper may possibly be read by a member of the Revenue Department. In that case, I would express the hope that he will not take offence at a bit of straightforward criticism and plain speaking, without which it would be impossible for me to make out my case in favour of fuller control by the Forest Department of the forest estates, which it is considered necessary to permanently maintain for the welfare of the country.

FUTAIE.

Injury by Insects and the value to Forests of the Enemies of these Insects.

TRANSLATION BY S. E.-W.

Under the above title there is an interesting Article in the *Forst und Jagd Zeitung* for October, 1892, by Dr. Adalbert Seitz. The author commences by remarking that in spite of the voluminous literature on this subject, there is still a want of uniformity in opinion in questions of forest zoology, which is sometimes painfully evident, as for instance in the discussion of laws prohibiting the destruction of birds, etc. He proposes to lay before the reader a *résumé* of the observations made during a five year's tour through natural and artificial forests in all parts of the world, not in the hope of settling for ever disputed questions, but rather with the thought of bringing them again under final discussion. Before entering on the subject of the enemies to insect life, it will be well to say a few words on the influence of insects, an influence which can only affect forest or agricultural interests when insects appear in abnormal

number. The reasons for such appearance must therefore first be discussed, happily it is only under abnormally favorable conditions that an abnormal swarm of any insect can occur in nature. Calamities caused by excessive production of insect life have been attributed to a disturbance of the natural equilibrium existing in the animal and vegetable Kingdoms, and man has been held responsible for such disturbance, but the author places no faith in such an equilibrium, for personal observations made in all parts of the world have revealed to him a constant fight for existence resulting frequently in the disappearance of some species. Further, if such an equilibrium existed in nature, there could be no questions of natural development and improvement in organic life: it would require the interference of man to cause the disappearance of one species and the appearance of another. Even if this much talked of equilibrium existed in nature, how would it be possible in cultivated areas where we have instead of moorland, wheat fields, and instead of virgin forests, plantations? That such changes must influence insect life is incontestable, but a few of the conditions which regulate the increase or decrease of that life must first be considered. The most potent factor with regard to this is Climate, and moths (which are the most important forest insect because they not only strip the foliage but by weakening the tree expose it to the future ravages of beetles) are, of all insects, most influenced thereby and although these climatic influences are most complicated in their action, yet careful observations lead to certain valuable conclusions. That the average annual temperature influences insect life may be gathered from the fact that the appearance of various insects shows a periodicity agreeing with the eleven year weather cycle. The years 1797, 1808, 1819, 1840 were remarkable for the damage done to forest growth by insects. No information is, unfortunately, forthcoming regarding 1830. The periodicity thus noticed is not a peculiarity in Europe, it has been long ago remarked in America. *Swinton* found that a few species which were under special observation for 44 years, swarmed plentifully in the years 1835, 1846, 1857 and 1868 and were scarcest in 1840-41, 1851-51, 1862-63 and 1873-74. The increase was always in the year of minimum area of sunspots, the decrease in the years of maximum area of the same. It cannot be considered extraordinary that the dates first quoted above do not agree with those entered below, for it must be remembered that the observations were made only in reference to a species, and the appearance of insects in abnormal numbers is influenced by other conditions than climate. In point of fact, in the years when one species is specially strongly represented, other species seem to disappear entirely; but when we consider climatic influences in detail, we arrive at results which are not forthcoming when we, as we have hitherto done, treat of climate generally. For instance, a mild winter is antagonistic to the increase of insects with a generation period of one year and which pass the winter in the larva stage. The reason of this well-known

fact was said by *von Frohawk* to be that, in mild winters, fewer insect-eating birds are destroyed by the severity of the climate, and the greater frequency of these birds in the following spring accounts for the decrease in the number of insects. The influence of birds on insect life has, however, as compared with that of climate, been much over rated, and *Barrett's* explanation appears to be much more probable, namely, that the mild winter conduces to breaks in the period of hibernations with the resulting decrease in the number of larvæ. It has frequently been remarked that with abnormally warm weather in December and January the caterpillars of *Bombyx rubi*, *Gastropacha pini*, and other species leave their winter quarters prematurely, only to die in thousands when, to them, unexpected cold weather again sets in. Late winters have also a harmful effect in the increase of some species. For instance, *Orgyia antiqua*, in years when a long and fine autumn has occurred, produces at the end of October a third brood, consisting almost entirely of male insects, for this reason that the female caterpillars, which form their cocoons much later, have not had time to complete the metamorphosis; it is of course a great disadvantage to the increase of the species that the majority of the males should appear in autumn, whilst the females do not appear till the following spring.

An unusual dryness and poverty of sap in the food-plants of insects, has an adverse influence on the development of the larvæ, so it is evident that hot and dry summers have also a pernicious effect on insect life, because slow development and late metamorphosis must increase the danger to the individual insect; in point of fact, dry summers are marked by scarcity of perfect insects and the large number of cripples and abnormal types that are found.

The power of resistance to meteorological conditions varies much with the species; for instance, the caterpillars of *Gastropacha pini* have been found in hollows which were during the winter full of rain water, and even frozen hard, so that it was possible to break the caterpillars in two or more pieces, yet when this frozen mass was thawed in a warmer atmosphere, the caterpillars at once revived. On the other hand, it may be remarked that, as the mean temperature of any locality falls, the northern limit of the species is proportionately restricted, and the reason of the disappearance of certain species from certain localities is frequently attributable to this cause. For instance, in the summer of 1880, in England, some butterflies disappeared altogether, whilst others became scarce and *Carrington* attributes this to the severe cold of the preceding winter; *Melitæa aurini*, which was common in Sussex up to 1884, does not exist there; whilst *Bryophila muralis* completely disappeared from Wiesbaden since the occurrence there of a heavy frost in May 1876. Insects, moreover, do not only differ in the ability of withstanding extremes of heat and cold, but also in the manner they are affected by changes in the weather. As every species is not in the same stage of development at periodically recurring

changes in climate, such changes must necessarily react in various ways in various species. In this circumstance lies the explanation of the fact that similar weather may result in the annihilation of one species and the increase of another.

After favorable climatic conditions, the most important factor in the increase of insect life is that of favourable weather during the breeding time; if all the individuals of one species arrive at perfection together, the chances of fructification of the individual are much increased. *Orygia pudibunda*, in ordinary years, exists as a perfect insect, from April to July; in 1889, however, all the moths of this species appeared simultaneously and ten days after not a single specimen could be found. It can be imagined what an effect in the increase of a species such an occurrence would have when the sexes did not have to wait for days exposed to all adverse influences before procreation took place. For many species, indeed, the possibility of procreation within a very limited period is a *sine qua non* of continuance of the species; for instance, *Zenzera aesculi* swarms only for one night and thereafter disappears; *Cosmia pyralina* is common in some localities, but is not frequently met with, because all the individuals of the species are developed within a period of three days. If, therefore, the weather during the short breeding time is unfavourable, the species may become for years almost extinct. Many species are, however, protected against such eventualities, as development is not completed save in favourable weather, provided always that unfavourable weather does not continue too long. In such cases, when, for instance, it rains during the whole of the breeding time, a hitherto common insect may be entirely rooted out; as, in 1859, *Agria tau* in Stuttgart. It is also the case that many insects, especially beetles, when hindered by unfavourable climatic influences, let a year pass by in waiting for the next season; for instance, *Sphinx ligustri* appears in England in the middle of June, but if the metamorphosis is not completed by that date, the larva remains till the following year, when the perfect insect appears. The moths which swarm in winter must frequently be obliged to remain in the cocoon for long periods, awaiting favourable weather; thus, *Endromis versicolor* sometimes remains two to three years in the cocoon; *Asteroscopus nuleculosus* three to four years and *Bombyx lanestris* frequently five years. In spite of this, however, abnormal weather frequently causes irregularities in the numbers of insects; it is known that cockchafers frequently appear (when in the larva stage) above ground at all seasons of the year, a proceeding which generally leads to the death of the individual; and butterflies frequently develop in winter and are found dead in the snow. Although the influence of the weather is most felt by butterflies or moths which live more or less in the open, yet these influences also affect the imperfect insect when in the larva stage; during the casting of the skin, the caterpillar finds difficulty in moving and its grasp is feeble, so that the effect of a storm is often to cover the ground with dead and

dying insects. After a storm, over one thousand caterpillars of one species have been found under a single tree. The dangers of storms to insect life are increased by adverse combinations such as rain and wind, or rain and cold ; in such cases, insects may be beaten to the ground and lose their powers of flight, or killed outright by the force of the rain. Thus, a wet and cold summer in 1888 followed by autumn frosts completely prevented an expected calamitous swarming of *Orgyia pudibunda* ; grubs of insects do not generally perish on account of flooding of their resting places, but die in large numbers when frost follows on such flooding.

As a conjunction of unfavorable circumstances is necessary to the extinction or diminution of any species, so any marked increase is impossible without the presence of many favorable conditions ; a single favourable season is, as a rule, not sufficient to ensure this result. *Kane* remarks that although a hot summer results in a scarcity of insects, yet in result the following year is favourable to an increase ; and it has been ascertained that *Leucania unipunctata*, which is so harmful in North America, requires two favourable years before the devastating army of caterpillars can be formed. The unusual warmth and dryness of the spring of 1889 permitted the injurious swarming of *Gastropacha pini* and prepared the way for the devastations of the "Nun" in the following year. This would not have occurred if the weather of 1890 had not also been favorable to insect life ; for instance, more moisture might have killed off the insects in large numbers. However favorable climatic circumstances may be, abnormal increase in any species cannot occur unless under certain conditions ; and, as already pointed out, many of these conditions and the most important of them are due to the interference of man. As the author was roaming along the banks of the Silver River in 1889, the terrible devastation caused by the caterpillar of the *Oiketicus Kirbyi* was specially remarkable, but what was most astonishing was that the greatest harm was done in the cultivated strips of land, the uncultivated portions had been spared ; so that, though everywhere the foliage was swarming with caterpillars, it was only on cultivation that the bushes were bare of leaves. In the spring of 1890 the author observed damage by caterpillars in the South of China. Opposite Hongkong, is a peninsula where conifers had been planted to ameliorate the climate ; beyond this artificially raised forest, extended naturally grown conifers which, however, were sparse, and consisted only of young or old and injured stems. The area under artificial growth had been severely injured by an insect, whilst in the natural forest not a caterpillar or moth was visible. These experiences agree with those of other observers. Wandering foresters have noticed that in the immense forests of North America, which, sad to say, are ever decreasing, few or no forest insects were seen ; the forests of the wild west do not suffer from insect pests, whilst in those of the Eastern States, where cultivation is extensive and extending, these have already appeared, but not yet

in overwhelming numbers. Thus, here also, the experience is arrived at, that, owing to improved sylviculture, insects that have before escaped the notice of the Forester, have now become an ever present evil; in fact, the extraordinary increase of the insect plague in the last sixty years appears to be favored by a rational system of agriculture and sylviculture. In spite of this knowledge, the reason for this remarkable fact is not yet evident, although some of the causes are not far to seek. The choice of species when creating a forest is of the first importance. It is known that certain trees are peculiarly sensitive to injury and afford nourishment to many species of insect; whilst others again only support one or a few species. As examples of this, the willow and the plane tree may be taken: the first is liable to injury by insects of many families, some of these are common on the trees, others confine their depredations entirely to the willow; there are, indeed, some forty species of insects which, more or less, affect this tree, of which about twenty are the larvæ of moths. On the other hand, the wood of the plane tree is very seldom injured, and there are only four species of insect which, occasionally, devour the foliage of this tree. Many other examples could be given in a similar manner; for instance, the aspen and the oak on the one hand, and the maple and horse chestnut on the other; it would indeed be possible to arrange a plantation which, beginning at one end with the lime tree and ending with the cypress, would show with great regularity the constantly decreasing predisposition of various trees to injury from insects. Further remarks on this subject would be here out of place; the conclusion, however, may be accepted that, as a rule, such plants should be cultivated that are in their original habitat, and that those exotics have the fewest enemies which are introduced into a country where similar species or those nearly related to them already exist. Of course, there are exceptions to this rule, as to every other; for example, the fuschia, which, on its introduction into California, was much ravaged by an insect which previously lived on an *Epilobium*; but a few exceptions cannot be held to upset any rule. An agricultural pest, *Mamestra oleracea*, makes itself at home on almost all exotic plants, on Begonias, Pelargoniums, etc., but, as a rule, it lives on cabbage and does no injury to other plants. Beyond the question of the suitable choice of species, the increase of certain insects is determined by the action of man in regard to the method of cultivation; for instance, the existence of close canopied pure forests permits of the passage of insects from tree to tree in search of new pasture; whilst, if the nature of the forest compels the insect to descend the tree in this search, the suppression of the undergrowth favours the larva in discovering new food supplies. Further, the removal of all undesirable tree growth tends to diminish the source of supply and thus many a hitherto harmless insect has been forced into becoming a danger to sylviculture. As an instance of this, take the case of the *Tortrix pilleriana* which lived in the immediate vicinity of the vineyards on various plants, but

when the Vineyards were cleared of weeds, caused great devastation amongst the vines. Another insect, *Plutella xylostella*, caused much damage in Mauritius amongst cabbages and turnips, simply because only useful plants were permitted in the fields; in Europe the same insect does little harm because it is capable of finding, and allowed to find, a living on plants worthless to man. Considerations of this kind explain the great power of resistance to damage by insects, so long known to be a strong point in favor of mixed forests; but under this term, the mixture of age classes as well as of species, should be understood. *Altum* has proved that in young pole forest, the enemies of the larvæ of certain forest insects are much fewer than in older forests; and the question naturally follows whether the admixture of older stems in a pole forest would not naturally increase these welcome enemies of insect life. In another work it has been shown that certain insects whose food is in no way dependent on the growth of large trees, are yet, for reasons unknown to us, dependent for their existence on the presence of such trees, and disappear when these are removed. We must therefore consider it an unfavorable condition for sylviculture when our forests are so regulated that our natural allies in the war against insect life cannot or will not visit them. It may also be noticed that certain insect pests which are reared in arable lands enter and devastate the forests when their former home provides no further food supply, and, as an instance of this, may be mentioned the *Agrotis segetum* which has been known to destroy the foliage of the oak.

(To be continued.)

Beetles which girdle Rose-bushes.

We have received from the Director of the Forest School some correspondence on this subject. The beetles were found by Mr. Foster, Deputy Conservator of Forests in Coorg, who wrote:—"These beetles cut off the stems clean in one night and large rose trees are thus cut down and destroyed." The beetles attack the main stem and girdle it, cutting away till the bush falls. The specimens were sent to Mr. E. C. Cotes in Calcutta, who stated that they were insects of the *Cerambycidae* Family, belonging to a species as yet unnamed. He considered them identical with insects noticed by the Collector of Kurnool as attacking the branches of a *Tabernaemontana*, a habit which they share in common with other kinds both in India and in America, and notably with a species *Celosterna scabrata*, Fabr. which was found by the Conservator of Forests in Oudh to damage sal saplings (See *Indian Forester*, Vol. XIV p. 508.) Some years ago we remember Mr. R. C. Wroughton sending some branch specimens from Bombay. Mr.

Cotes says that the objects of the beetle is to kill the branch with a view to laying its eggs afterwards in the dead wood above the ring. Mr. Foster says, however, that they cut the stem clean off and that after the severance is complete, the beetle remains at the top of the separated stem.

The Forests of the United States of North America.

Under the above title, Sir Dietrich Brandis has published a pamphlet of 44 pages which is reviewed shortly in the *Forst und Jagd Zeitung* for October 1892. The work is recommended to the notice of those who, interested in the growth of exotics, have already directed their attention to the peculiarities of forest growth in distant countries. Dr. Brandis, from his long experience in the East Indies, is especially in a position to draw instructive comparison between the vegetation of India and that of North America, and the opportunity for the issue of his pamphlet was given by the publication, during the last few years, of many works on the subject of the forests in America.

Amongst others may be cited ; Sargent's Report on the forests of North America in 1884 ; Semler's "Tropical and North American Forests" in 1888 ; Mayr's "Forests of North America" in 1890 ; Fernow's "Industrie Forestière" in 1889 ; and Kessler's "Forest Notes from America" in 1890. Dr. Mayr's work has chiefly been taken advantage of by Dr. Brandis in order to compare his experiences with those of that author ; and although his observations in most instances tend to prove the same results, yet in some instances, he arrives at different conclusions. Dr. Mayr, for instance, holds that evergreen broad-leaved species require more warmth than broad-leaved deciduous species ; and that, in the tropics, as there is no alternation of seasons, there are also no species which for a period of the year remain leafless. Dr. Brandis naturally objects to these theories, so far as the forests of India are concerned. Some other conclusions arrived at by Dr. Mayr are also carefully investigated. For instance, that author states that the heaviest and most resinous pine wood grows in the south ; so far at least as weight is concerned, these good qualities diminish in more northern localities and the most northerly species of pine "*Pinus Strobus*" yields the lightest, if not the most resinous timber. Again the falling off in the length of the needles of the various species of pine, is more dependent on the habitat of the tree, than on warmth and moisture. The more northerly species have the shortest needles. Dr. Brandis, on the other hand, finds that there is no connection between the weight of the wood, length of needle and climatic conditions in the habitat of the various species of pine in India. Another point of difference in North American and Indian forests is pointed out by

Dr. Brandis. Dr. Mayr arrives at the conclusion that the absence of tree growth on the Prairie Zone is due to insufficient rainfall during the period of active growth, although the average atmospheric moisture is sufficient ; and although this may be the case in America, yet in certain localities in India, this conclusion will not be valid.

With the exception of certain differences, similar to those above stated, both Dr. Brandis and Dr. Mayr are in agreement in the conclusions drawn from their study of, and experiences in, the forests in India and North America.

O. C.

II.—CORRESPONDENCE.

Are the rings of 'Avicennia' wood annual ?

DEAR SIR,

Can you inform me whether the concentric rings in the wood of the mangrove (*Avicennia officinalis*) are annual rings, or not ?

The Mangrove has always been considered a fast grower, one (conservator suggesting five years as the rotation for wood to be used for house fire-wood of about 1½ to 2" diameter; but I have found, on examination of several specimens lately, that the rings numbered 25·7 on the average per inch of radius.

As Mangrove grows in swamps which are covered daily with water (saltish) at high tide, and as the temperature near the coast is more or less uniform throughout the year, it is possible that the rings are not annual rings. I cannot, however, find particulars about them anywhere.

A. W. LUSHINGTON.

Avicennia is not the true mangrove, but is one of the most common of the trees which form the mangrove forests in the estuaries of our great rivers. In regard to its annual rings, we can certainly answer Mr. Lushington's question in the negative and we see that Professor Nördlinger says the same. The concentric rings of *Avicennia* are like those of some *Capparideæ* notably *Niebuhria linearis* and *Cadaba trifoliata* ; also those of *Dalbergia paniculata* ; and there are other species also. These rings are not complete : in *Dalbergia*, they may, we believe, be sometimes traced in a spiral ; in the other species named, as in *Avicennia*, they meet each other, or end abruptly, shewing that they cannot represent rings of annual growth. The description of the wood given in the 'Manual of Indian Timbers' badly requires revision. The annexed small cut

taken from one of Professor Nördlinger's sections, shews roughly the character of the wood of *Avicennia* and ought to satisfy Mr. Lushington that he will have to find some other method than counting rings for determining the rate and growth of *Avicennia* in the forests of the Kistna Delta.

Hon. Ed.



III.—OFFICIAL PAPERS & INTELLIGENCE.

Right of Way.

Our attention has been drawn to a decision passed in 1886, by the Forest Settlement Officer of Malabar, in the case of a claim under the Madras Forest Act to right of way from a coffee estate through a Government Forest to a road. The following is the order of the Settlement Officer referred to. It shews very clearly the distinction between 'rights' and 'privileges,' or, as they are 'better called, 'concessions.'

"It is manifest that no legal right has been established, and also, having regard to the provisions of section 15 of Imperial Act 'V of 1882 (The Indian Easement Act, 1882) that no prescriptive easement operating as a right against the State has been proved. The claim to enjoy the right of way as of right must, therefore, and is hereby, wholly rejected. This rejection does not interfere with the concession made by the District Forest Officer and referred to in column 6, it being distinctly understood that the concession does not operate as a legal right and is withdrawable at will."

"These privileges are not claimed as right, but merely asked for as a matter of favour. It is not within the province of this Court to deal with requests, but to determine claims. It will therefore suffice to record that no legal rights are granted over the several paths referred to in column 4, but the District Forest Officer expressed his willingness, as by favor, the concessions not operating as rights, and being withdrawable at will."

IV.—REVIEWS.

The Forage plants of Australia.

In a land like Australia where the breeding of stock is the chief agricultural industry of the country, the importance of an accurate knowledge of the different native fodder plants, cannot be underestimated, and the appearance of this publication of the Department of Agriculture of New South Wales, shows that the Government of the Colony is fully alive to its value. The book gives a series of pictures of 92 important fodder plants of various families, excluding the grasses; and each plate is accompanied by an appropriate description of the plant and of its qualities as a fodder. Twenty-five orders are represented, but by far the largest number of species figured belong to the family which gives the different kinds of 'Salt-bush' the *Chenopodiaceæ*, for no less than 37 of the plates refer to members of the family. The next largest order represented is *Leguminosæ* with 13 species. Then come *Cruciferae* and *Myoporineæ* with 5 each, *Supindulaceæ* with 4, *Malvaceæ* and *Amarnataceæ* with 3. The last plate in the book gives the "Nardoo" *Marsilea Drummondii*, a cryptogamic plant allied to the Ferns, upon which the unfortunate explorers Burke and Wills were compelled to endeavour, for a while, to support existence. Stock of all descriptions, however, are said to be very fond of it and the Australian aborigines also use its spore cases for food.

It is interesting to find that the author was at one time disposed to think that a free introduction of exotics would be well in order to supplant the native herbage. Experience, however, has made him change his mind, and the stock animals themselves bear him out, as it seems that they prefer the indigenous to the introduced kinds of grass. Of interest to us in India, is Mr. Turner's opinion that tall growing grasses, even such kinds as *Reana*, *Sorghum*, maize and the big species of *Panicum*, are scarcely ever so nutritious as the more dwarf ones. Here in India, where the native cattle graziers think it so necessary to burn the grass in the forests for grazing purposes, they forget, as we have more than once pointed out, that thereby they destroy the smaller more nutritious kinds and foster only the growth of the tall species, which, except in the form of quite fresh shoots, are almost always hard and inedible. On the question of this annual burning, the following remarks of Mr. Turner fully deserve quotation.

"It has often been asked of me whether I favour the annual 'burning off of grasses. Except in three cases, I am decidedly 'against burning off, for the following reasons :—

1. "It destroys millions of grass seeds which an occasional good season may have brought to maturity, thereby destroying the only natural means for their reproduction. A fire also destroys many valuable Salsolaceous and other plants. 2. After burning off, if favourable weather ensues, new growth is made quickly, and sheep turned in on this eat greedily of it, which gives them what is commonly termed the scours or diarrhoea, which often becomes chronic, and, of course, has such a weakening effect upon them that many die. Nor is this all, for in biting out the young growth from the heart of the plant, much of the latter is brought with it, which of course partially destroys it. If a fire should take place, sheep should never be turned into the pasture until it has made considerable growth, though cattle may be turned in without any serious damage being done, for they never eat grasses so low as do sheep. I may here mention the fact that sheep destroy the natural grasses and herbage in much less time than horses, and they again much sooner than cattle.

"I am in favour of burning off annually under three such peculiar conditions as the following:—1, where grasses are much diseased with parasitic fungi; 2, where there is a predominance of spear grasses; and 3, where there are growing such rank grasses as those I describe as suitable for wet or undrained soils, for along with this coarse growth many noxious plants and fungoid pests are destroyed. (Very rarely good pasture plants other than grasses, will grow in such situations.) Pasture in these circumstances becomes more healthy, the fire acting as a disinfectant and contagious diseases disappear. Grasses that will grow in low, damp situations, are a valuable standby for the pastoralist during protracted droughts."

These remarks are of the greatest importance, and although in the past 20 years a very great advance has been made in the teaching not only of the people of this country, but also of their rulers, that fire is not a necessary aid to the provision of good pasture, there are many people still who adhere to the old notions and think no good pasture is obtainable without fire. As an object lesson in the advantages of protection of grazing lands from fire, we know of none more valuable than what can be seen any day in the Nilgiri mountains of South India, by any one who examines the grass of the 'downs' where it is regularly burnt and consists chiefly of tussocks of coarse wiry kinds, with bare patches between, and that of the fire protected slopes of Dodabelta where even in dry seasons may be obtained good grazing on tender species of nutritious value.

The plates are rather roughly done, but to our mind bear the stamp of accuracy and seem faithfully to represent the common appearance of each plant. They seem to have been cheaply done by some process of nature-printing, aided afterwards by careful drawing. The preface contains an important acknowledgement by the

Minister for Agriculture of Mr. Turner's services in the cause of the grazing community by the publication of this useful little work. We wish there were a similar one for India, with the grasses given also in addition to other kinds of common fodder plants.

'The Forage Plants of Australia' by F. Turner, F.L.S., R.H.S., Published by the Department of Agriculture, N. S. Wales.

Forestry in South Australia in 1891-92.

In our No. for November 1892 (Vol. XVIII, p. 436), we reviewed the Report for 1890-91, and drew attention to several important points ; *first*, the apparent neglect of the natural forests, *secondly*, the strange system of natural reproduction by means of forest fires ; *thirdly*, the apparent inexhaustibility of the Wirrabara Reserve ; *fourthly*, our inability to understand the system of "leasing" the reserves ; and *finally*, the financial failure of the Department.

We are very far from wishing to condemn the system under which large compact plantations can be formed near centres of demand and along lines of communication, for we have before us in Changa Manga, an excellent example of a most valuable and important success in this way ; but ever since the Department of Forestry in South Australia has been started, we have noticed the comparative indifference with which the Conservator and his Assistants seem to regard the natural forests, those areas which, in other countries, are looked upon as the chief ones for protection and the principal sources of supply. The new Report tells us nothing more on the subject, and even on the visit of the Attorney General, the Commissioner of Public Works and other important personages to the Reserves, only the plantations seem to have been inspected and approved. The area of plantation amounts to about 16 square miles while the Reserves contain 336. A great fuss is made in the Report because 530 acres of one Reserve were taken to form a National Park and yet, apparently, there is no system of conservancy in the Reserves, unless there are provisions in the mysterious arrangement of 'leasing' under which protection is ensured.

The most interesting point in the Report is the account of rate of growth. Four principal species gave the following results.

	Age.	Height.	Diameter.
Blue Gum (<i>Eucalyptus Globulus</i>) ...	14 year	67 ft.	23 in.
Sugar Gum (<i>Eucalyptus corynocalyx</i>)	14 "	68 ft.	16 "
Remarkable Pine (<i>Pinus insignis</i>)...	15 "	49 "	12 "
Upright Poplar (<i>Populus fastigiata</i>)	13 "	65 "	10 "

Both the Blue Gum and the Pine can shew, on the Nilgiris results to equal if not to exceed these; all the same, 2½ rings per inch of radius, is a fine growth for any species of Pine. The worst is, that this very quick growth in conifers usually means a soft easily destructible wood. The introduction of edible dates seems to be making great progress and the results will doubtless be of great importance to the Colony.

The Revenue for the year came to £5,177 and the expenditure to £7,992, of which £2,699 on establishment, and £5,293 on works. There were also special votes, chiefly for planting, amounting to £4,057, of which £2,333 only were spent.

Annual Report on Agriculture in Bombay for 1891-92.

There is much of general interest in this Report just received, but only a little of special note for Forest Officers. We quote, however, the following extract regarding Fodder Crops at the Poona Farm, as we are always glad to see anything done towards the attainment of better systems of cattle-feeding than the present wasteful one of allowing most of the waste lands of the country to be kept in a poor state from over pasture, and forests prevented from reproducing themselves through the necessity of allowing them to be over-grazed. We expect, however, that all these experiments are carried on on good soil which would carry a high rate of assessment. What, we think, is mostly wanted, is an extension of the grass-farming works so admirably started by our Military authorities; and the discovery of good kinds of fodder that can be easily and cheaply grown on poor lands so as to make it possible to feed cattle on cut material and to improve their quality by stopping indiscriminate inter-breeding and allowing the selection of breeding animals.

“The greater portion of the farm was occupied by *Fodder Crops* for the use of the dairy herd, and the interest of the experiments conducted during the year, centres mainly on these crops, which are of growing importance in view of the rapidly diminishing area of waste lands and of the increasing value of dairy products. The fodders compared were *Lathyrus sylvestris*, lucerne, guinea grass, *Reana luxurians* Kulthi (*Dolichos uniflorus*), sundhiajowari and Kodwal (two varieties of *Sorghum*). The first named plant has so far proved practically a failure. Lucerne, though second to guinea grass in yield, produces, owing to its high price, the largest profit. But it is a delicate crop, and its young seedlings are subject to insect attacks between July and October. Guinea grass has the highest outturn, at the same time being practically exempt from disease and insect pests and growing well under shade trees. *Reana luxurians* (teosinte) gave promise of being a useful fodder, but it does not appear to

‘have any advantage over Jowari beyond that it is claimed to be a perennial plant. Its permanency, however, is shown by the year’s results to be more than doubtful. The indigenous fodder crops are all seasonal, and their yields are necessarily comparatively low. The Kodwal or hot weather Jowari yield best, but cost heavily for irrigation, the Sundhia or Gujarat fodder Jowari come next in yield, appearing, however, to be rather delicate in the Deccan climate. Kulthie is rather a wasteful fodder for well fed cattle, as they reject the courser stalks.”

Bengal Forest Report for 1891-92.

This is an excellent and interesting Report and we are glad to see that the Review of it by the Bengal Government, commences with a well deserved tribute to Mr. Dansey’s energy which it gives us pleasure to reprint :—

“The Bengal Forests have been under the able charge of Mr. Dansey, who acted as Conservator throughout the year. His tours covered a period of 251 days, in the course of which he paid two visits to Orissa on important duty in connection with the Forests of Angul and Khurda, travelled over the whole of Chota Nagpur, examining the Palamau, Ranchi, and Koderma Forests, and acquiring a fair insight into the condition of the private forest estates, visited the Sonthal Parganas, inspected the Forests of the Jalpaiguri Division, and had nearly completed his inspection of the Buxa Forests, when he was compelled by fever to return to headquarters, which he reached on the 1st May. This record of activity in inspection deserves the highest commendation. Mr. Dansey, however, is not satisfied that justice was done to the Circle even by a tour of this length. He rightly regards an intimate personal knowledge of the whole of the Forests under his charge as essential to the performance of one of his principal duties, that of deciding how each Forest shall be worked to the greatest economic advantage, and as an instance of the kind of action which might be possible elsewhere, if he were in possession of complete information, he cites the beneficial result of this visit to Singhbhum. He found there that sál trees were being sold at a fixed price per tree, with option to the purchaser to choose his own trees. Under his direction this faulty procedure gave place to a system under which a given number of trees are marked on a given area irrespective of the quantity and quality of the timber, except that trees apparently hollow are excluded. The marked trees are then advertised in lots and tenders invited. The introduction of this system raised the average price of sál trees in Singhbhum by one-half. The Lieutenant-Governor recognizes that this is a good example of the

'advantages of personal inspection, although the thesis hardly required proof, as it is an accepted principle of administration with His Honour. Every one must feel that the area which Mr. Dansey has to control is too large for him to inspect thoroughly and in every detail and at once. But, on the other hand, if he had been able in one-and-a-half years to see everything, the work of inspection would have lost much of its interest, and would, after a few years, become dull and monotonous.'

The difficulty about the inspection of the Bengal Forests does not consist so much on the size of the Reserved area as in the long distance from place to place. There is one group of forests in the north and under the Himalayas; another in the wilds of Chota Nagpur; another in Orissa; another across the bay in Chittagong and yet another in the Ganges delta. Each of these has its own peculiar features in the way of climate, mode of travel, etc., and the differences constitute so many difficulties. One great difficulty is that of going speedily from one forest locality to another with all the necessary equipment for travel. And so we are sorry to see that the Government does not seem disposed to take up Mr. Dansey's proposal for the Establishment of two Circles in Bengal.

It is satisfactory that there seems at last to be some chance of the forests of the Sonthal Parganas being brought under the professional agency of the Department; and that the unclassed State Forests in Chota Nagpore, Angul and Chittagong are also to be brought under management. We do not, however, quite understand what advantages are expected to be derived from making them 'Protected Forests.' Last year, in our Review in the December number: we noticed the complaint that good Bengali subordinates could not be obtained, we see that this year again the Conservator has some strong remarks on the same subject and that Sir Charles Elliot still thinks that "the Bengali has in him 'capacities for physical activity which are only now beginning to be developed.'" For our own part, we cannot help thinking that the real reason for failure to get good men lies in the absence of inducement in the way of a suitable flow of promotion to the higher grades of the Provincial Service. If native passed students from the Forest School, see young Anglo-Indians from the same institution put over their heads again and again, it is not surprising if they resign or at any rate fail to do their best. On this subject we reproduce the following from the *Pioneer* of November 6th.

"In connection with Forestry in Bengal, the question has arisen whether the natives of the Provinces are physically qualified for the post of Rangers. The Conservator holds that where rough work has to be done and an active life led, they are not equal to the strain thus involved. The Lieutenant-Governor, however, will not accept this conclusion without further trials being made. He sets forth his belief that the Bengali has in him capacities for physical activity which are only now beginning to be developed. "Already,"

‘he writes, “Bengali officers have in other departments, and especially in explorations beyond our northern frontiers, shown great powers of physical activity ;” but he is careful to add that it is unquestionably desirable that in the selection of candidates for forest work great attention should be paid to their physique and to their inclination for a hard and active out-of-door life in the jungles. The pay of the Ranger class has apparently been so low hitherto that good men have not been enlisted for the appointments open to native candidates ; but it is hoped that under the new scheme, which gives greater chances of advancement, the Department will secure Rangers who combine activity with intelligence. The latter quality is never lacking in the Bengali, but we doubt whether the Conservator is not right in his estimate of the physical inability of the inhabitants of the steamy plains of the Lower Provinces to do rough work. Perhaps the rising generation, which is taking kindly to athletics and out-door games, may produce men of better physique than we have been accustomed to see, but these must not be looked for among the book-worms whose highest aim in life is to obtain a University degree.”

The Financial results of the year were the best on record, the Revenue having been Rs. 7,89,553, and the surplus Rs. 3,81,034. One noticeable feature of the year was the improvement in the Sundarbans’ timber trade, and another, the working of the Singbhum-Sal forests. We will conclude with a further extract from the “*Pioneer*” which is worthy of reproduction as a tribute of sympathy with a department which has probably more up-hill work to contend with, and more enemies, than any other in the country.

“The Resolution by the Lieutenant-Governor of Bengal on the Annual Forest Report for the Province, is couched in very different terms from that of the Bombay Government, to which attention was drawn a few days ago. Sir Charles Elliott acknowledges the conspicuous zeal and ability displayed by the Conservator, and he does not indulge in acrimonious criticism of his work. Forestry in Bengal is making good progress, the surplus in the past year having reached nearly four lakhs of rupees. The Sundarbun timber-trade has revived ; the outturn from the Singbhum forests has greatly increased ; offences against the regulations have fallen from over 200 to less than 80 ; and generally the Department seems to carry on its operations smoothly and satisfactorily. But the superior establishment is far too weak for the duties which it has to discharge, and the preparation of working plans, which are essential to the success of forest operations, has been delayed in consequence. The Government of India have declared that it will be impossible to post any new officers to Bengal until next year, and the Conservator must therefore do the best he can with the small staff under his orders. The subordinate establishment, too, is greatly in need of reinforcement, but a remedy will be applied in this instance when the new scheme for the whole of India is carried out.”

V.-SHIKAR.

A Trip to Bara Bangahal.

1st June.—Up early and started immediately for Bhêli Gote. The tramp through the fine old Pine Forests in the cool fresh morning was very enjoyable. The number of wind-fallen trees all along these forests, with a northern aspect, is enormous, the ridges in many places are denuded of trees. While all hands were engaged in pitching tents and getting the camp settled, the old Shikary and I strolled away over some very steep ground to prospect the country. Across the ravine opposite to us was spotted a brown bear, but he was on the move, and we soon lost sight of him; soon after we sighted another higher up, but he too was going as if the devil were after him, he was a fine specimen, and so we made a great effort to meet him near the snow line, but never saw him again. As it was getting dark we scrambled down the hill again, as fast we could, and on the opposite spur we caught sight of two more bears both of which were rushing about in a most curious way, which puzzled me very much, I asked the Shikary if this was the pairing season, and if these excited males were in search of females, of course he did not know, but if the "Sahib" thought so, it must be right. Not one of the four bears we had seen this evening halted for a single moment to feed.

2nd June.—Bhêli Gote. Decided to halt a day here. While having "chota hazri" outside the tent, got "khabar" that two bears were feeding in a 'gote' on the opposite hill, the rifles being ready, we started immediately, and after crossing a deep ravine with a steep pull up on the opposite side, we came close up to the pair, they had evidently scented us, for they very uneasy, and kept looking down in our direction, so I took a hurried shot at the larger one of the two and rolled her over; reloading quickly, for I only had a single barrel rifle, I meant to take a shot at the other bear as he ran past us, but had suddenly to change my line of fire, the old she bear, who had recovered herself and come down towards us looking very angry and savage, the second shot finished her, but the cub made good his escape. This decided me to invest in a double barrelled rifle as soon as possible, for one is not only liable to

get chawed up before one has time to reload, but many a good chance is lost of bagging game from the want of a second barrel. Returned to breakfast and spent the rest of the day answering a post received during the night, and inspecting some patches of Blue Pine Forests.

The whole hill side here is covered with lilies of the valley and a variety of lovely wild flowers. In the afternoon, scrambled up to the snows to see the view from the higher peaks, saw another large bear in the same excited state. There is no mistaking the males, for they are larger, heavier built, and have a decided hump of thick hair over the shoulders. Killed an adder near the tent.

3rd June.—Awoke early, feeling very tired and seedy. Had breakfast early and started for the lower valley near the village of Bara Bangahal. Was much interested in watching a large flock of sheep crossing a very narrow and rickety bridge over the Ravi, which is a foaming torrent here, I fully expected one-half of them would have been hustled over the sides of the bridge by the others, but the old gaddi shepherd understood his business, and got them over wonderfully, he couldn't however prevent his flock getting hopelessly mixed up with two others on the opposite side, and I fully expected, there would have been no end of a quarrel on separating the flocks, for none of the sheep were marked in any way, and I was much astonished to see how each man knew his sheep and separated each his own without an angry word passing their lips.

4th June.—Up later than usual, feeling very unwell, and started for the Roygar valley about 7 o'clock. The Ravi, covered over with snow, in places 20 feet deep, forms the base of the valley, the slopes on either side are covered with Blue Pine, and occasionally deodar in the lower end of the long valley. The winter was an unusually severe one, and avalanches more numerous. For several miles the slopes were covered thickly with fallen trees heaped one on the top of the other, the result of avalanches, which had rushed down the slopes and covered the Ravi below. The road lay for some distance over the bed of snow which covered the Ravi, the foaming waters of which could be distinctly heard roaring below. The cold was intense and I felt unwell and had finally to give in; taking shelter under a large rock, I lay down to rest and sent my breakfast cooly to get some water, I had just dosed off to sleep when the cooly returned very excited and said he had seen a very large bear in the next clearing. I was not at all inclined to leave my sheltered resting place, but the man was so certain that the bear was really a fine specimen, that I determined to go and see. We soon reached the clearing at the end of which, there was certainly the finest old bear I had ever seen. The ground was covered with huge stones brought down by avalanches, and the stalking was therefore easy. I got at last an easy broadside shot at him at about 80 yards and was delighted to see him roll over into a snow

drift below. For a time we lost sight of him and I began to fear I had lost him, but hurrying up the ridge of snow, we came right on to him, and what a monster he looked as he raised his enormous head, and glared at us. Fearing to lose him, I gave him a second shot through the head, and finished him. His skin and stuffed head now hang on the walls of my hall, rare trophies of a very pleasant trip in the snowy wilds. As soon as the excitement was over, the bilious attack returned with greater force, and I had at last to double up under a shelving rock and sleep till the camp came up, when I had the tents pitched as soon as possible in the Dalli Gote and was very glad to get into bed, though I had had nothing to eat since "chota hazri." Dalli Gote is a lovely spot, there are no less than nine waterfalls opposite the camp, and the hill sides are covered with the most beautiful wild flowers, while the crags and cliffs all round are very wild and grand.

5th June.—Up very early, feeling seedy still, but started sharp for the head of the valley. The scenery is very grand, the cliffs are enormous. The air is cold and crisp, and the stillness so marked, that not a sound of a living thing is to be heard. Soon after starting, we got to a nice looking gote and spotted two bears, the upper one, which was the smaller of the two, was evidently being hunted by the other. I got an easy shot at the lower one, and bagged him: the other escaped before I could reload. After breakfast, we continued our way up to the head of the valley. The Shikary suddenly sighted two bears which came galloping down the nala towards us playing like a couple of dogs; we watched them for a time, and then I got behind a rock to wait for them; the leading bear had turned off and was making for the opposite hill; I got a bad shot at her and broke her leg, and we had then to run along the snow to get another chance at her as she crossed the ridge. I got a running shot and rolled her over into the nala below, but she was up again and was attempting to cross a roaring stream as the third shot finished her. Meanwhile what had become of the second bear was the question. We ran back and saw him crossing over some deep snow: he was a long way off, but it was good practice, so I squatted down and had nine shots at him at long distances, and only hit him once, but lost him. Later on I got this same bear lower down the valley.

F. O. L.

(*To be continued.*)

VI.—EXTRACTS, NOTES AND QUERIES.

The Obstacles to Home Timber-growing

Sir Arther Grant, *Bart.*, of Monymusk, Aberdeenshire, in noticing a review of the *Journal of the Royal Horticultural Society*, makes some interesting remarks on his experience in forestry. When old plantations were planted (he says), four pests of the forester did not exist in this (Aberdeenshire) part of Scotland—the rabbit, the squirrel, the Larch disease, and the lucifer match. Do what you like, it is very difficult to keep the rabbit entirely out of the plantation, and you must make up your mind to lose a proportion of newly-planted trees, and the trees are not out of danger for some years. When they are 25 feet high, or thereabouts, the squirrel attacks the Scotch Fir, eating the bark in spring on the sunny side. As a rule, he clears a patch perhaps 4 by 6 inches. From this the sap oozes out, and the winter wind snaps off the top, perhaps 4 or 5 feet from the tip; after this, your tree makes little progress. It is very difficult to see the squirrels in the Fir trees, and they are prolific little rascals. After killing perhaps 500 squirrels in a year, I find the damage the following year to be little lessened, and I have thousands upon thousands of promising Scotch Firs destroyed or grievously injured by them at the present moment. Again, when your Larches have been planted perhaps twelve to fifteen years, the disease begins to show, and in many places, at about thirty to forty years of age, they go “pumped” in the centre, whilst yet too small to have much timber-value. Silver Firs also are now very subject to disease. Lastly, we have the lucifer match. Never a year goes by but we suffer at Monymusk more or less from the recklessly careless tourist or labourer, who lights his pipe, wanders on, and if he starts a fire, makes himself scarce at once. Last year a great deal of wood and young plantation and moor in Aberdeenshire was destroyed in this reckless fashion. In Switzerland they have very severe laws about firing the woods. These are some of the difficulties which surround modern plantations from which the older foresters were free.

In regard to profit, the labour of ditching, draining, fencing with walls, planting, and caretaking was much cheaper in the old days than at present. There was some sale for thinnings, which were largely used for rails. Now wire fencing and iron fences have stopped nearly the whole of that outlet, and thinnings will not pay for cutting and hauling. Twenty years ago, Larch timber was selling at 1s. 6d. per foot. This year, I have known of some sold for 4d., and the best price would be between 6d. and

9d., except possibly in some very exceptional position. The accessibility of a wood has, of course, an enormous influence on the price. Scotch Fir, again, was sold at Monymusk early in the century for 1s. 9d. per foot; 4d. would be about the price nowadays—of course I mean in large quantities. Put £100 into plantation nowadays, put £100 out to interest at 5 per cent., and for every £40 you get for your timber in sixty years, you will get £70 in the other investment, and you will not have the loss occasioned by rabbits, squirrels, Larch disease, and fire; you will not have fences to keep up, or to employ men to destroy the vermin, and oftentimes to turn out your neighbour's cattle, which are busily destroying your young trees. I plant some 300,000 to 500,000 of trees yearly, but I know it is a poor investment, and I do it first as a family tradition; second, to give shelter and improve the climate; third, because it employs a very considerable number of people, both in summer and winter.

The old timber found in old castles was probably "natural grown," of very great age when cut, and placed in suitable positions for keeping. I have, on the contrary, plenty of beams probably 120 years old which are full of dry-rot, and much infested with the wood-beetle. I find the more beautiful and rare *Coniferae* to be all perfectly unsuited to the climate of Monymusk. Some may do for ornament—none, apparently, for business.—(*Gardener's Chronicle.*)

Lord Lansdowne on the Forests of India.

One of the grievances of the people of India is the administration of the Forest Department, the native element contending that the Forest Department are the trustees, not owners, administrators, and not revenue earners, which gave rise, at the last Session of the National Congress, at Nagpur, to an interesting debate. The congress having made representations on the subject to the Viceroy, Lord Lansdowne referred to the subject in a speech at Mysore, in which his lordship said, "I will ask you to remember that not only here, but in all parts of this country, the Government of India has no desire to administer the forests except for the benefit of the population adjoining them. It is our object that forest administration should be conducted with the utmost regard to the comfort and convenience of the cultivators, but, unless proper measures are taken to protect the forests of India from destruction, the country as a whole will suffer greatly. In some parts of India, the injury already done is irretrievable, but where forests still exist, we are determined to manage them as trustees for the whole community, and nothing is further from our intentions than to encourage anything like arbitrary or oppressive treatment of persons possessing grazing rights or otherwise entitled to the use of forest products." (*Madras Mail.*)

Working the Circular Saw.

By M. POWIS BALE, M. Inst. M. E. ; A.M. Inst. C. E.

Owing to the ever-increasing competition in the wood converting industries, to ensure a moderate return on invested capital, it has become necessary to economise in every possible way, and to reduce the working expenses to the lowest limit. If judiciously undertaken, and not carried to excess, a distinct saving in power and wood may be effected by the employment of thin gauge saws, this sawing, of course, largely depending on the nature of the work, and the value of the wood. The successful working of thin circular saws depends to a considerable extent on the skill of the operators, but there are certain points of construction and detail that are most important factors in bringing about this result, and those we purpose to notice briefly on the present occasion.

In the first place, the saw bench itself should be of substantial construction, and be kept in perfect order. The fence must be carefully fitted and be perfectly true, a fine adjustment screw can be recommended. The bearing spindle and saw collar should be accurately fitted, and kept in first-class condition. The saw must be correctly speeded; about 8,000 to 9,000 ft. traverse at the points of the teeth may be accepted as a standard. When the saws are ordered from the maker, it is important that he be informed of the speed that it is intended to run at, so that he can "compensate" or hammer the saw so as to properly allow for the increased expansion of the rim over the centre owing to its greater velocity. Many saws are not "compensated" correctly, and this is a fruitful cause of their heating and running from the line. As already mentioned, saws when running expand more at the periphery than at the centre, consequently they should be hammered "open" and uniform at the centre, so that when in work they straighten themselves and consequently run in a true line.

The number and shape of the teeth should be determined by the nature and hardness of the wood to be sawn, by the rate of feed required, and by the gauge of the saw. No absolute rule can be laid down as regards the number of teeth, as the conditions of working vary so much; some makers allow from one to four teeth for every inch in diameter of the saw according to the work required of the saw, the harder the wood the greater the number of teeth. It need hardly be said that the saw should be of the finest possible quality of steel, combining as far as may be toughness with hardness.

For very thin sawing, or for sawing valuable woods, a "ground off" or taper saw can be recommended, but this form of saw is unsuited for breaking down logs or heavy planks. In lieu of a ground off saw, a thin gauge saw fitted with a centre stiffener

is often employed. In this case the stiffener is a steel disc extending to about half the diameter of the saw, it is about three-sixteenths of an inch in thickness in the centre and is tapered down to a thin edge, the saw itself being tapered from the periphery of the disc to the teeth. For breaking down very valuable woods, where a frame saw is not available, a circular saw tapered on both sides and fitted with collars or stiffeners can be used.

It must be borne in mind that the thinner the gauge of the saw the greater in proportion will be the number of teeth required to turn out the same amount of work as a saw of thicker gauge, this arises from the increased liability of the thin saw to spring sideways and follow the grain of the wood.

Other very important factors in the successful working of thin gauge saws are the shape and uniform length, spacing, and gulleting of the teeth, the uniform sharpening and setting of the teeth, and the speed at which the wood is fed through the saw. It need hardly be said that the shape, number, and length of the teeth should be adapted to the nature of the wood, but this question is such a wide one that we cannot here give it more than a passing notice. The teeth should be of equal length, so that they all take their fair share of work, and the gullets should also be uniform, so that when the saw is at full speed it will be perfectly in balance, and the centrifugal force set up will be equal.

To enable saws of thin gauge to be run successfully, it is important that they be very carefully and evenly "packed." For this purpose we can recommend the employment of either two pieces of hoop iron or strips of hard wood of the length of the saw from the teeth to the eye, and of a width that will reach not quite flush with the top of the table; then take some flax or rope yarn end, lap it evenly round the strips from end to end till they are made thick enough to fill the packing space, and bear evenly and not tightly against the whole front half of the saw plate up to spindle; this will be found a better plan than ramming, as if the packing be tighter at one point than another, the friction on the sawplate is uneven, and it will often cause a thin gauge saw to run wavy. End play on the saw spindle must be prevented, and care must be taken that the diameter and width of the driving pulley on the saw-spindle are ample to permit the use of a driving-belt that will run the saw up to its full speed without slip, and consequent variation in speed. The belt must be kept soft and pliant, and easy, and very evenly joined, so that there is no jump as it passes over the pulley.

As we have before remarked, the thinness of the gauge at which a saw may be safely run without "buckling" depends in a large measure on the skill of the operator, the selection of the right shaped tooth, and the proper set according to the nature of the wood being cut. The "packing" and sharpening of the saw are

also important matters ; in point of fact, to be really successful in working thin gauge saws, they must be kept in what may be termed scientific order. For speeding a thin gauge saw, it must be borne in mind they cannot safely be run so fast as a saw of thicker gauge, as they expand and heat more rapidly, and are more likely to become rim or centre bound and pliant in working, and will therefore run from the line. For a like reason, too rapid a feed of the wood must not be attempted, and the teeth must be provided with a sufficiency of throat space to allow of an easy escape of the saw-dust, and prevent clogging of the saw. No absolute rules can, of course, be laid down in this connection, as they must of necessity vary somewhat according to the nature of the wood.—(*Timber Trades Journal*.)

The 'Karri' wood of W. Australia as a Paving Material.

We have received from Messrs Temperley & Co., of 72 Bishopsgate St., a copy of their pamphlet on the subject of this new wood recently introduced as a material for wood-paving. It is the produce of the *Eucalyptus colossea* or *diversicolor* and is found near Torbay in W. Australia close to the port of Albany. The trees are very large, often giving boles of 150 ft. up to the first branch, and individuals have been met with that were 400 ft. high in all, as recorded by Baron Ferdinand von Mueller, K. C. M. G., the State Botanist of Victoria. The estates of Messrs C. and E. Millar were recently visited by Mr. Ednie Brown, the Conservator of Forests in N. S. Wales, who expressed himself as very much impressed with their value in forests of this and other species of *Eucalyptus*.

Messrs Temperley & Co. are anxious to find agents in India for the 'Karri' wood which they are selling in the form of planks at the rate of £7 nett per load of 50 feet. They think that prices at the Indian ports ought to be not less than those at English ones.

We have never yet heard of 'Karri' being tried for building or Railway purposes in India. 'Jarrah' has been occasionally used for sleepers, but considering that our own good supply of Deodar, Sál and Pynkado wood only barely finds a market, we should say that the Australian woods have not much chance at present against the fashionable pot and trough iron sleepers which are probably so much used more on account of the facility of obtaining them than on account of their being more lasting than wood.

VII.—TIMBER AND PRODUCE TRADE.

Churchill and Sim's Circular.

February 2nd, 1893.

EAST INDIA TEAK.—The Dock deliveries continue on a reduced scale, being 628 loads for the month, against 842 loads in January, 1892, and 1359 loads in 1891. Prices are low but steady, there being no great pressure of supplies, and the stock being very moderate. Moreover, it is calculated that the ship building programme for our own and for foreign warships will account this year for a good proportion of the prospective shipments.

ROSEWOOD.—**EAST INDIA.**—Continues very quiet, the stock is not heavy, but sales are not readily effected.

SATINWOOD.—Logs, if large or figury, would sell fairly well but *planks* and *boards* are not wanted.

EBONY.—**EAST INDIA.**—Remains dull and sales are not easily effected, although prices are low.

PRICE CURRENT.

Indian Teak	per load	£9	10s.	to	£15
Satinwood	per ton	£5		to	£10
Rosewood	"	£5		to	£9
Ebony	"	£5		to	£8

MARKET RATES OF PRODUCTS.

(Tropical Agriculturist, February, 1893.)

Cardamoms, Malabar	per lb.	2s.	to	2s.6d.
Croton seeds	per cwt.	15s.	to	20s.
Cutch	"	20s.	to	32s.
Gum Arabic, Madras	"	40s.	to	80s.
Gum Kino	"	110s.	to	120s.
India Rubber, Assam	per lb.	1s.7d.	to	2s.3d.
" Burma	"	1s.7d.	to	1s.11d.
Myrabolams, Bombay	per cwt	10s.	to	11s.3d.
" Jubbulpore	"	8s.9d.	to	9s.6d.
" Godavari	"	8s.	to	8s.6d.
Nux Vomica, good	"	8s.	to	9s.6d.
Orchella, Ceylon	"	22s.	to	28s.
Redwood	per ton	£3	to	£3-10s.
Sandalwood, logs	"	£35	to	£65
" chips	"	£9	to	£30

Statement of average selling rates of timber and bamboos in Meerut, Cawnpore, Bulandshahr, Pilibhit, Bareilly, and Moradabad for the quarter ending 31st December, 1892.

Description.	Timber Scantlings per score.		Bamboos per 100 score.		REMARKS.
	From	To	From	To	
MEERUT.					
R. A. P.	R. A. P.	R. A. P.			
Sal 10' Tors (Poles) ...	8 0 0	18 0 0	...	...
Sal & Sain, &c., Karris, 12' x 5" x 4" ...	25 0 0	40 0 0	...	...
Sal bed posts, 7' x 2½" x 2½" ...	8 0 0	10 0 0	...	...
Bamboos of 9' to 10' per 100 score ...	...	...	28 0 0	80 0 0	
CAWNPORE.					
Sal 10' Tors (Poles) ...	5 0 0	6 0 0	...	...
Sal, and Sain &c., Karris, 12' x 5" x 4" ...	9 0 0	10 0 0	...	...
Sal bed posts, 7' x 2½" x 2½" ...	2 8 0	3 0 0	...	...
Bamboos of 9' to 10' per 100 score ...	...	...	15 0 0	35 0 0	
BULANDSHAHR.					
Sal 10' Tors (Poles) ...	...	...	...	...
Sal, and Sain &c., Karris, 12' x 5" x 4" ...	...	...	...	...
Sal bed posts, 7' x 2½" x 2½" ...	...	...	...	...
Bamboos of 9' to 10' per 100 score ...	...	...	50 0 0	50 0 0	
PILIBHIT.					
Sal 10' Tors (Poles) ...	40 0 0	70 0 0	...	...
Sal and Sain, &c. Karris 12' x 5" x 4" ...	30 0 0	40 0 0	...	...
Sal bed posts 7' x 2½" x 2½" ...	5 0 0	6 4 0	...	...
Bamboos of 9' to 10' per 100 score ...	...	...	60 0 0	100 0 0	
BAREILLY.					
Sal 10' Tors (Poles) ...	5 0 0	10 0 0	...	...
Sal & Sain, &c., Karris, 12' x 5" x 4" ...	25 0 0	35 0 0	...	...
	50 0 0	40 0 0	...	...
	50 0 0	60 0 0	...	...
Sal bed posts 7 x 2½" x 2½" ...	10 0 0	15 0 0	...	...
Bamboos of 9' to 10, per 100 score ...	...	...	50 0 0	137 8 0	
MORADABA D.					
Sal 10' Tors (Poles) ...	20 0 0	25 0 0	...	...
Sal, & Sain, &c., Karris, 12' x 5" x 4" ...	30 0 0	50 0 0	...	...
Sal bed posts 7' x 2½" x 2½" ...	10 0 0	12 8 0	
Bamboos of 9' to 10' per 100 score	50 0 0	100 0 0	

THE INDIAN FORESTER.

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April, 1893.

[No 4.

A plea for Protected Forests.

Mr. Baden Powell in his Manual entitled "Jurisprudence for Forest Officers" has given it as his opinion that Protected Forest is not a permanent Forest Estate, that it only serves to prevent the rapid deterioration of growth where conditions are as yet undeveloped, and where permanent, *i.e.* *Reserved* forests, cannot be decided on ; and elsewhere in the same Manual he expresses the hope, if it be remembered aright, that Chapter IV of the Indian Forest Act will be expunged from any future edition of the Act which may be compiled for the whole of India and Burmah. It is doubtful whether his suggestion will ever be carried out : should, however, such a step be contemplated, Government, it is hoped, will pause before taking it, as climatic and other conditions vary so considerably on this vast continent that a universal code would scarcely be applicable to every locality.

In all Provinces where forests depend on a rainfall, Reserves undoubtedly are desirable ; but what about those localities where rainfall is almost an unknown factor, (at any rate for all practical purposes) and where sylviculture is dependent entirely on river floods. A part of India exists where such a condition of things prevails, and probably it will not be out of place, and may be of interest, to describe some of these conditions and show how the maintenance of forests is affected thereby, and how the requirements of Chapter IV of the Act seem specially adapted to meet their case.

The forests under notice are situated along the river on alluvial land and extend along both banks for 150 to 200 miles, not however forming an unbroken chain of vegetation, for here and there Government waste and Zemandari property intervene. As may be imagined, this alluvial soil suffers considerably from exposure to the wearing action of the stream. In the cold weather (November to February) the river is low ; nevertheless active in eroding its banks. At this period, the erosion is gradual, and its progress can be both observed and heard ; in the stillness of the night the falling in of the overhanging fragments of a bank are distinctly audible like reports of heavy cannon.

During May, the waters begin to rise in vast volumes, soil is rapidly eroded, and belts of jungle two and three hundred yards deep containing *Populus euphratica*, *Acacia arabica* and *Tamarix gallica* are rolled over and over into the stream. *

A little later, the river overflows its banks, and floods the country within the limits permitted by the Irrigation Department ; and when it falls, generally in September, it will often be found to have cut a new channel for itself. This "erratic wanderer" at times makes a detour bisecting a large forest and leaving a wide gulf between the two parts. At another time, a slice removed from one forest is left as it were as an accretion to another on the opposite bank, or if the land opposite be Zemindari or Government waste it is claimed by either of the latter. In this manner, the riverside areas are constantly fluctuating, and diminishing, and not unfrequently vanishing.

In view of such ever-changing and unstable conditions, the question arises whether the constitution of Protected instead of Reserved Forests in similar circumstances is not desirable, and whether, as a matter of fact, these very conditions in consequence of the value of the property, do not make it incumbent on the Legislature to provide for the formation of a class of forest which can cope with these changes. The provisions of Chapter IV. seem to meet the case entirely.

A Reserved Forest is created after elaborate and refined demarcation and settlement under the auspices of a Special Officer at considerable expense, and much time often elapses between the notification under Section 4 and the final one under Section 19. Four and five years have been known to elapse in some instances. In the interim, with such conditions existing as described, it might be found, when the notification under Section 19 came to be made, that the greater portion of the forest had disappeared, or that it was entirely *non est*. The forests which now exist are all Reserves, and were made so under Chapter V, Section 34 when the Forest Act came into force in 1878.

A Protected Forest, on the contrary, can be formed by one sweep of the pen and without the aid of special means. A Forest Settlement Officer is not necessarily needed to demarcate and enquire into it, *vide* Chapter IV, Section 28, clause 3, and the important feature is, that exploitation in it can commence immediately after notification. It can be worked quite as efficiently as a Reserved Forest, the only difference being that the working plan would require Government sanction, *vide* Chapter IV, Section 29. But to create a permanent structure on land which is *ipso facto* temporary is rather unreasonable. The folly of such a proceeding was forcibly illustrated recently when important defence works were erected on the bank of the river one season, only to be swept away the next ; and yet, indeed, some authorities would construct permanent forest estates to be swept away in like manner. The removal of Chapter IV from the Act would mean nothing more than this.

In view of such ever changing and unstable conditions as described, it may well be asked, how came extensive forests to be formed at all, and if they last only a few seasons, what value can the growth in them be from a forest point of view ?

The facts are that formerly the river floods were allowed to spread over the greater part of the country, except into towns and large villages which were surrounded by embankments, silt was distributed uniformly over a wide area, and the bed of the river followed a serpentine course merely flowing over the country as water will if made to run gently over a tolerably level surface. It sought, at intervals of long duration, a new channel as all inundation rivers will ; but this channel was not subjected to any deep scouring out process, as a more rapid and direct flow, under similar circumstances, would cause.

A dense forest, for instance, was not carried away bodily, its obstruction rather causing the river to break and form an island or make a wide detour, round it.

Erosion, under such conditions, though of course present, was imperceptibly felt, and the changes wrought were so gradual that canopied forest had time to form and establish itself.

The drawbacks, however, attending a river whose course was liable to fluctuate in this manner and whose floods meandered here there and everywhere, were agricultural uncertainty, insecurity of life and property, and general unhealthiness of the District. To remedy this state of things, the P. W. D. erected "bunds" on either side of the stream and substituted a system of irrigation by a network of canals for the District which have undoubtedly benefitted the country ; but while all other interests have been served, the forests undoubtedly have suffered. These forests outside the "bunds," for instance, are all drying up, artificial irrigation as it is found, is too expensive to maintain them, and, in a few years, the place thereof will know them no more ; but it is with regard to those within the bunds that it is sought to invite attention.

The constantly occurring changes in the forest areas here as previously explained, which are almost kaleidoscopic in their character, have only begun to be marked since the development of the "bund" system. The embankments often run through a forest or sometimes form an outer boundary of a forest on both banks. The river, in the cold months, is a narrow channel between. In the hot weather, however, it rises and forms a mighty roaring flood whose waters get heaped up against the embankments, some times so high as to spill over them. The banking up of the waters contributes, as is natural, to the more rapid deposition of silt at the sides than in the centre of the stream where the current is rapid. The surface of the land at the sides therefore gets quickly raised ; but the bed of the stream itself is slowly being raised too, and when it has risen so high that the water is no longer able to be retained in the same channel, the river swerves and seeks a new course scouring its way through thickly deposited silt and jungle, and clearing everything before it as chaff before the wind.

It may be gathered that the time arrives when this "wanderer" is under the necessity of abandoning the new channel thus formed; it then leaves a fresh alluvial deposit in place of the canopied forest which previously existed. This lasts for about seven or eight or perhaps ten seasons, when the stream returns probably to its old course to perform the same operation of destruction as before; but of course on a much minor scale. In this way the river, being hemmed in, dances about from bank to bank within its specified limits, affording no time for the formation of any large timber trees. A complete change, therefore, is taking place in the character of the forest, which only the Forest Officer sees, and the disastrous effects of which it is difficult to make others fully understand. What is needed of course is, to give the river space for far 'greater expansion than it at present enjoys' this will diminish its velocity and force, and mitigate the rapid changes that now occur. In the interests of the public weal, the "bunds" must stand, otherwise from a forest point of view they ought, of course, to be done away with altogether. As regards the use to which these temporary forests can be put, it may be mentioned that they yield poles and rafters and a large quantity of firewood which is utilized as fuel for Steamers, for the Railway Locomotives, and for various mill industries.

Tamarix gallica and *Populus euphratica* seedlings are to be seen in countless thousands on a bank which has been recently abandoned by the river, and in less than half a dozen years a first coupe may be made from them. As an instance of the rapid reproduction of Tamarisk, coppice shoots, 19 months old, have reached a girth of $5\frac{1}{4}$ ", and instances of girths of 3" and 4" are not uncommon.

The question of large timber, however, is one of very serious importance, for a considerable income is derived from this source, which, if the present irrigation plans continue, will entirely disappear in a few years.

G E M.

Injury by Insects and the value to Forests of the Enemies of those Insects.

The more we gain an insight into the fact that not only are the means at our disposal to prevent injury by insects quite inadequate, but also that the artificial working of the forests may in itself favor an excessive reproduction of certain insects, so much the more we must acknowledge the necessity of an ability to recognize the enemies of such insects and of ascertaining in what way they are helpful. The enemies of an insect may be divided into external and internal enemies, and of the former, bats are amongst the most important. These animals are indeed seldom

mentioned as being destructive to insect life, but on account of their avidity and owing to the fact that they feed at night and therefore on insects which are not exposed to destruction by birds, they become of the greatest consequence. Many of the insects most harmful to forest growth only fly by night and are protected during the day by their color which is assimilated to the bark of the tree on which they feed, and it has been frequently noticed that excessive reproduction of such insects is followed by an abnormally large gathering of bats in the forests affected. As bats only feed on the wing, they can only destroy full grown insects, and do not affect in any way the eggs or immature insects of any species; on the other hand they devour enormous numbers of mature females, which, as we will show later on, seem to be protected against the ravages of birds, and thereby prevent the birth of thousands of caterpillars and consequent harm to forest growth. It is an error common to those who do not observe, to assume that the number of bats is insignificant, and that therefore their influence on insect life is small. This however, is not the case: the number of birds is generally overestimated because they are for the most part diurnal in their habits and also noisier than bats. In point of fact, bats are in most localities more numerous than birds. Other insect-eating animals are, from the forester's point of view, of much less importance than bats; they are probably as ravenous as bats, but as they feed on immature insects whose chance of producing young is much smaller than that of the mature insect, the good they effect is not so marked. Insectivorous animals are of much more importance in Agriculture than in Sylviculture, for in the former, the injury by insects is mainly accomplished by the grub of the Cockchafer etc. Amongst other Mammalia which feed on insects may be mentioned the fox, badger, martins, rats, mice and rodents; these animals are mentioned only to complete the list of other insect enemies, but they have no influence whatever on the numbers or increase of insect life.

We cannot, however, pass over the value of birds in so cursory a manner. It is a well-known fact that many species of birds feed themselves and their young on insects and caterpillars, which are harmful to vegetation; and we all admit that the presence of insectivorous birds in a garden is a subject for congratulation. In agriculture, birds play a part of some importance in preventing the excessive increase of insect life; the almost universal destruction of hedges which has taken place during the last few years was predicted as certain to be followed by an enormous increase in insect life. In point of fact, although birds were driven to find shelter at a greater distance from cultivation, there was no marked increase in insect life discernible. The value of birds as insect enemies is often overrated. For instance, the number of insects varies enormously from year to year; the number of birds remains fairly constant; it is evident therefore that the ordinary number of birds cannot produce much effect on an abnormal number of

insects produced in any given year. The answer to this argument is that birds flock to the locality where insects are abundant; but this is not by any means definitely proved; observations have been made by trustworthy naturalists of a most contradictory nature. It must also be remembered that many insects are more or less perfectly protected against birds and that amongst these are many of the most harmful. Many experiments and observations are recorded in reference to the reasons of birds for avoiding certain insects, and to discover why some insects are devoured by certain species of birds and not by others. It is probable that insects which are so avoided are poisonous to the species avoiding them; but *Zenizera Aesculi* is avoided by all birds, who show the greatest anxiety in the presence of this moth. Butler attributes this astonishing fact to the coloring of the wings of this insect; and it is remarkable that a similar coloring is present with the "Nun" which is seldom or never attacked by birds, showing that in the latter instance the coloring is purely protective. The author here enters on a long dissertation on the numbers of individual species of birds in Europe, and values each species separately with regard to its power of destruction of insect life. These details are not of great practical importance for an Indian Forest, so long as we are acquainted with the result arrived at, which is briefly, that in spite of all the good done by birds, their influence on insect life is not sufficient to prevent any abnormal increase thereof. Such an increase is provoked by favorable climatic influences alone and superabundant insect life is destroyed by adverse climatic or other influences alone. A single fruit tree, an isolated patch of forest, a garden, may indeed be benefited by the action of birds but in large tracts of forest they have no practical effect. In fact in the commotion raised in the last few years regarding protection of birds, too much stress has been laid on their value as destroyers of insect life. The great insect plagues which have devastated large areas of forest have been stayed by parasites and climatic influences. Ratzeburg remarks that the *ichneumon* flies have more value as insect destroyers than birds, and Pfeil writes that if the Ichneumonidæ could sing, much useful sympathy would be diverted to their species. In this, all must be agreed that in such discussions a hard and fast line must be drawn between sentiment and fact, and whilst bitterly regretting the wholesale destruction of birds and rejoicing over the protective laws passed for their benefit, it must at the same time be acknowledged that their utility has been much exaggerated.

If birds have, owing to the fact that they are so agreeably remarkable, succeeded in attaining an unmerited position in regard to their capabilities of destroying insect life, this cannot be said to be the case with lizards. The number of species is indeed small, but the aid afforded by this animal should not be undervalued as the number of individuals is very large. In sunny spots in forests there are often more lizards than birds, but it is difficult to see

them, so secretive are their habits. Moreover, the number of lizards depends much on the locality: for instance in Northern Italy, lizards are probably ten times as numerous as birds; in South Germany the latter are much more common. The lizard does not go far from its home, but as its beat is restricted, so its search for prey is extremely careful: every leaf and twig is inspected. The food varies with the season of the year and is composed of harmless as well as harmful insects; but although in certain circumstances lizards may be useful, yet their action can have no more practical effect than that of bats and birds. Amongst amphibious animals, frogs and toads feed on insects. The stomach of the common frog is often full of insects both harmful and harmless, but frogs do not as a rule frequent forests, with the exception of the tree frog which is comparatively rare in Europe, though it is apparently frequent in the tropics. In Japan, for instance, tree frogs appear to be more abundant in certain localities than birds.

Vertebrate animals, as enemies of insect life, perform, however, an insignificant rôle compared to that filled by the invertebrata. Most of these latter belong to those classified as *external* enemies but there are a few which can be reckoned as *internal*. Amongst others, the ants, representing an important factor in the forces of nature, rank as enemies to insect life. Ants have indeed been artificially introduced into forests devastated by *Cnetocampa pinivora*, with the result that though the ants killed such larvæ as came in their way, they ultimately left the forest. Such experiments are useless, unless the relationship of ants and other insects are better proved. It has been remarked that ants live in the same trees with all kinds of insects and caterpillars and do not molest them, and the conclusion has been arrived at, that ants in ordinary circumstances do not prey on insects, but only kill such individuals as may be sickly or are found in abnormal circumstances such as fallen from trees, &c. If this were not the case it is probable that ants would so increase that in a short time they would dispose of the rest of the insect world. The term 'ordinary circumstances' must of necessity have only a limited application, but the conclusion to be arrived at is, that ants do not seriously affect insect life so long as it is vigorous, but should the insects be weakened by climatic influences or other causes, this is taken immediate advantage of by the ever ready ant. Mention may be made of certain wasps which prey on insects, but they have no special importance from a forest point of view as their food consists equally of harmful and harmless insects. Some of the Hemiptera are also useful as feeding on caterpillars, especially *Tropicoris rufipes*; in Europe, however, the Hemiptera are of little significance although they are apparently of more importance in tropical countries. The same may be said of many other insects such as grasshoppers, beetles, etc., etc. It is not doubted that such insects do feed on insects harmful to forest growth, but they do not confine their exertions to such species. Amongst the many thousands of species of insects to be found in

European forests, scarcely 100 species are harmful and only about 20 are capable of causing widespread devastation ; it is therefore evident that the action of invertebrate enemies to insect life cannot be compared with that of the internal enemies of insects. These internal enemies are divided into animal and vegetable life, and to understand the subject correctly, some old errors and absurdities, up till now believed in, must be abandoned ; and although it is not the aim of this paper to abolish these beliefs, their untruth must be exposed where necessary. For instance, Ratzeburg arrived at the extraordinary conclusion that the parasites of the *Ichneumon* and *Tachina* only affected unhealthy caterpillars ; so that they were of no utility as destroyers of insect life. This has been proved to be utterly false, as infected caterpillars after being operated on have produced healthy moths ; moreover, in spite of the presence of parasites, moths have been formed before and after the development of the perfect parasitical insect. It is astonishing to find during the prevalence of an epidemic, that hardly any caterpillars contained parasites, and on the other hand to observe that it was not found possible to inoculate with fungoid growth such insects as already contained parasites. The explanation of this need not be entered upon here ; it follows on biological laws and is merely mentioned to show that animal and vegetable parasites do not work against each other and that it cannot be taken as an absolute fact that parasites only attack either sound or unsound individuals. The slow increase of parasitical insects has been brought forward as a proof of their low value as insect destroyers. In the first year of abnormal increase of harmful insects, parasites cannot, it is true, proportionately increase ; the increase of the parasite must follow and cannot be coincident with the increase of his supporter ; but in the second year the proportion of deaths from parasites largely increases, whilst in the third the insect on which it preys is practically exterminated. The following statistics on this subject may be interesting. During a period when *Gastropacha pini* was present in normal numbers, only 2 per cent were infested by parasites ; whereas 26 per cent were infested during a period when the numbers were commencing to increase. At the end of a plague of these caterpillars it was found that of one hundred specimens, 32 were suffering from an epidemic and 54 from parasites. The great value of the *Ichneumon* and *Tachina* is that they confine their action to a single or a few species. The author here gives a paragraph on the question of the frequency and death of the *Ichneumons*, he finds that the frequency of the parasite rises and falls with the frequency of the caterpillar. He points out that this relationship does not exist between the vertebrate enemies to insect life and their insect food, from whence it happens that birds may be able to exterminate a species that has been almost destroyed by disease, or adverse climate, whereas they would produce no effect in the numbers of the same species when abnormally frequent. The parasitical insects are enabled by their power of producing a

very numerous progeny, to adapt themselves easily to an increase in number of the insects which support them. It has been proved that one larva of a butterfly can afford nourishment to several thousand parasites and as we may assume that all the parasites found in one caterpillar are the offspring of one mother, some idea of the fecundity of these insects may be obtained. Although it has sometimes happened that parasitical insects have directly prevented an abnormal increase of a particular species of insect, this is not generally the case: as a general rule the plague of insects is terminated by an epidemic. We have already pointed out that the great value of parasitical insects depends on the fact that they confine their attacks to harmful insects; and in regard to fungoid growths this is still more marked. Most epidemics occur amongst larvae when these are produced in abnormal numbers, and in most instances in the case of harmful insects, with one notable exception however, that of the silkworm. When it was first discovered that insect epidemics were due to fungoid growth, many different maladies were distinguished which were, however, finally discovered to be different forms of a few fungi. Pasteur for instance only distinguishes four forms of the silkworm disease. It will be sufficient here to remark that the same mistake has been made in reference to fungoid disease of insects, as was made about parasitic insects; it was thought that the disease only attained importance when insect life was superabundant. It was recognized that the epidemic in conjunction with parasitic insects brought to an end the devastation wrought by insects, but only careful observers noted the spread of the epidemic before the abnormal swarming of the harmful insects had reached its zenith. The result of the coincident swarming and plague was that the former was prolonged so that it only reached its period of greatest activity when the fungoid germs had also reached the highest reproductive power. In one locality, the percentage of plague stricken caterpillars rose within 10 days from 15 to 51 per cent., a proof of the destructive nature of the disease. There are, moreover, certain diseases which are hereditary, and which, as it is known in the case of the silkworm result in feeble and deformed offspring. At any rate, the effect of such a plague in harmful insects is very deadly, and before a species can recover itself, the forest receives a well earned rest for its recovery. The result of observations made on insect epidemics shows that the idea of preventing the devastation by artificially inducing disease is worthy of attention. The author here devotes some paragraphs to the question of cultivation of bacteria, quoting suitable insects for this purpose. He is certain that much more effective results are to be obtained in this manner than by the wholesale protection of birds which has no effect whatever. The object of the paper is to direct observation and enquiry into the points discussed and any facts which prove or disprove the statements made, will serve a useful purpose in clearing up the subject.

DR. ADALBERT SEITZ,

GIESSEN.

Influence on the vegetation of a forest of the removal of dead leaves from the soil.

Under this head, experiments extending over a period of several years have been carried out by the Prussian Forest Experimental Station, the results of which have recently been communicated to a contributor to the *Révue des Eaux et Forêts* by the Director of the "Station," Dr. A. Schwappach.

The experiments were made in two forests of beech, situated in totally different localities, one being in hilly ground near Trèves at an altitude of some 1,800 feet and on a soil of poor or medium quality, the other being near Stettin on a fertile diluvial soil with a sub-soil of marl.

In the first case, the areas experimented with were perfectly divided into five equal portions, one portion being allowed to remain untouched; from the second dead leaves were removed every year; from the third every two years and from the fourth and fifth every four and six years respectively.

In the second case, the areas were divided into two portions, the ages of the crops on the three different areas so divided being different. From one half of each area, dead leaves were removed annually, the other remaining untouched.

Tables are appended giving the periodic increase in volume of the crops on each sub-division of the area; in the first case for five periods of six years and in the second for two periods of nine years. These tables show that in the forest growing on poor soil, there was an average loss of growth in the volume for the last three periods of 51 per cent when the dead leaves were removed every year

" 40	"	"	"	"	"	"	"	" 2 years.
" 22	"	"	"	"	"	"	"	4 "
" 9	"	"	"	"	"	"	"	6 "

In the crops growing on good soil, the loss due to the annual removal of dead leaves during a period of 18 years was

25 per cent in the crop aged 50 years (in 1873).

21 " " " " 77 " "

11 " " " " 74 " "

These figures would seem to show conclusively that the removal of dead leaves is more harmful on poor soils than on fertile ones, that on the former the practice may diminish the production of wood by more than one half. Also that the influence of the removal of the leaves is greater, the more frequently and the longer the practice is continued.

Dispersion of seed by birds.

(From the *Révue des Sciences naturelles appliquées*).

Many birds travel more than 400 metres a minute and are thus able in a very short space of time to carry to distant regions the seeds of plants on which they feed.

Mr. PISTONI of Messina has been making observations on this subject in Sicily, where plants peculiar to northern climates are to be found alongside the indigenous plants of the country. On this island, birds seek for and disseminate chiefly the following species :—

BIRDS.	PLANT ON WHICH THEY FEED.
Corvidæ : <i>Corvus frugilegus</i> , <i>Cornix monedula</i> . Pious <i>Graculus</i> , <i>Garrulus glandarius</i> .	{ Fruits of <i>Prunus avium</i> . Olive. Fig, Date. Dwarf palm, and <i>Cornus Mas</i> .
<i>Oriolus Galbula</i>.	| <i>Phillyrea variabilis</i> . <i>Prunus Cerasus</i> .
Sparrow and Chaffinch.	{ <i>Arbutus Unedo</i> . <i>Morus nigra</i> and <i>alba</i> . <i>Linum usitatissimum</i> and <i>strictum</i> .
Canary (<i>Serinus hortulanus</i>).	| Cruciferae. <i>Koenigia maritima</i> .
<i>Emberiza Schœnioules</i> . (Rosy Ortolan).	{ <i>Phalaris Canariensis</i> . <i>Setaria italica</i> . <i>Panicum miliaceum</i> .
Thrushes (<i>Turdus pilaris</i> , <i>torquatus</i>).	{ <i>Vaccinium Myrtillus</i> . <i>Myrtus communis</i> . <i>Rubus discolor</i> and <i>tomentosus</i> .
Hawfinch (<i>Coccothraustes vulgaris</i>).	{ <i>Mespilus germanica</i> . <i>Cratægeus Azerolus</i> .
<i>Turdus viscivorus</i>.	| Mistletoe.
Warblers. <i>Sylvia hortensis</i> , <i>cinerea</i> , <i>atricapilla</i> , <i>conspicillata</i> .	{ Figs—cultivated in wild form.
Nightingale. <i>Philomela luscinia</i>.	| Strawberry.
Robin. (<i>Erithacus rubicola</i>).	| Elders. <i>Sambucus nigra</i> and <i>Ebulus</i> .
Tomtit. (<i>Parus major</i>).	| <i>Arbutus Unedo</i> .
Marsh-tit. (<i>Parus biarmicus</i> , <i>pendulinus</i>).	{ <i>Calamagrostis</i> , <i>Arundo</i> and <i>Phragmites</i> .
Wren (<i>Regulus ignicapillus</i> , <i>oristatus</i>).	| <i>Juniperus oxycedrus</i> .
<i>Accentor alpinus</i> and <i>modularis</i>.	| Briars.
Doves (<i>Columba palumbus</i>).	| Leguminosæ and oaks.
Quail (<i>Coturnix</i> . sp. sp.)	| <i>Phytolacca decandra</i> .

Several curious examples of this method of disseminating seed are quoted. From the Botanical Garden at Palermo the small bulbs of *Oxalis cernua* were unearthed by birds and in a short time sown in all the fields in the neighbourhood. Through the agency of wild pigeons, two oaks (*Q. Macedonica* and *Ægilops*) are now growing in certain localities of Sicily, and Sardinia.

Seeds swallowed by birds germinate easily after having been digested. In Sicily, where many quail are killed, it is the custom to remove the contents of their stomachs and plant them in pots by which means rare and foreign plants are often obtained.

Imperial Forest School, Dehra Dun.

THE ANNUAL PRIZE DAY.

The distribution of prizes and certificates to the successful students of the Imperial Forest School class of 1891-93 took place in the large drawing hall of the School at Dehra on the 29th March. Sir E. C. Buck, Kt., C. S. I., C. S., Secretary to the Government of India in the Revenue and Agricultural Department, presided at the distribution, and was supported by Mr. B. Ribbentrop, C. I. E., Inspector-General of Forests : Colonel Doveton, Mr. H. C. Hill, and Mr. E. P. Dansey, Conservators of Forests; Mr. J. S. Gamble, the Director of the School ; Mr. A. Smythies, the Deputy Director ; Mr. A. F. Gradon and Mr. C. G. Rogers, Instructors at the School ; Mr. E. McA. Moir, Mr. N. Hearle, and Mr. A. P. Grenfell, Deputy Conservators, School Circle and Mr. J. L. Pigot, Assistant Inspector-General. Among the guests present were Colonel Strahan, R. E., of the G. T. Survey ; Colonel Begbie, 2nd P. W. O. Gurkhas ; Mr. W. N. Boutflower, Inspector of Schools, Agra Circle ; Mr. W. H. Reynolds, Superintendent of Forest Surveys ; Mr. E. Thurston, Reporter on Economic Products to the Government of India ; Dr. Leather, Agricultural Chemist ; Mr. Leslie Rogers, Major Commandant of the Dehra Dun Mounted Rifles ; Mr. J. H. Ivens, Executive Engineer ; and many other ladies and gentlemen, residents of Dehra and the neighbourhood.

The Imperial Forest School building was once the residence of the officer commanding the Sirmoor Battalion, previous to the occupation of the new cantonment to the west of Dehra. The house has been greatly enlarged and extended to meet the requirements of a training college for forest officers in India ; it is now a pretentious mass of buildings, prettily situated in a large, well laid out garden, which is the constant care of the Director, and well repays the attention he bestows upon it. The Forestry course is spread over two years, four months each year being spent by the students at the school and seven months in camp ; the junior students visiting the forests in the Siwaliks, and the seniors the forests of the Punjab and Central India, and preparing a project for the final examination. The walls of the drawing hall on the prize day were covered with well executed specimens of the work done by the students during their course—inspection houses, bridges, road surveys, &c. ; and on the table were the prizes—microscopes, drawing instruments, and medals, having a well engraved picture of the school on the obverse, and the name of the winner on the reverse.

The proceedings at the distribution of prizes began with the report of the Director, Mr. J. S. Gamble, M. A., who said : " We

are here assembled to bid good-bye to the students of the class of 1891-93, who have successfully passed the school course; they now leave us with certificates and some with prizes. The two years during which the class has been here have been uneventful; there has been no change in the personnel of the staff, which means that work has been regular. I wish to convey my warmest acknowledgments to Mr. Smythies, the Deputy Director; Messrs. Gradon and Rogers, the Instructors; and to the rest of the school staff, for their ever ready help and assistance. I trust they will all accept my most cordial thanks. To the officers of the Circle, Messrs. Moir, Hearle, and Grenfell, my best thanks are also due, especially to Mr. Moir, whose strong sympathy with the School is well known, and whose invaluable assistance in our hill tour in Jaunsar has done so much to make it an interesting excursion and a pleasant outing. Nor must I forget to tender my thanks to Messrs. Duthie and Cotes for their help in lectures and examinations on botany and zoology, nor Mr. Reynolds and Mr. Thurston for their help in examinations. The School now has 101 students, the largest number that has yet attended. Next rains we expect a still larger number, probably 120, a number beyond which we can hardly manage to go, consistent with our accommodation. Last year there were 80 candidates for admission; this year the number has been 150 to both classes. The results of the examinations are now known to you. There were 7 failures out of 45 students, which I regret, but I think the results were good. Like last year there have been no honours men, but I am sure the Inspector-General and the Board of Control will acknowledge that the results have been very satisfactory, and that the class now leaving us have distinguished themselves by their observations and attention to practical work. I here take the opportunity of impressing upon the junior class the necessity for observation, especially as they are now about to visit Jaunsar, one of the most interesting of the hill forest divisions in India.

Last year, at the prize giving, the Inspector-General was kind enough to announce that he would give a prize for the best essay on practical forestry; that prize has been won by A. M. Sawyer, whom I congratulate; and the Government of India, in recognition of his excellent essay, have added a copy of the *Dictionary of Economic Products*, the valuable work we owe to Sir Edward Buck, who has this year paid us the compliment of being present. The Deputy Director, Mr. Smythies' prize for practical work has been won by C. S. Rogers; that given by Mr. Gilbert Rogers, for the best notebook, by Dhanjishah Avasia. My own prize for the best drawing has been won by Ramnath Mukerjee, and Mr. Moir's prize for the best in forestry subjects by Hari Keshav Washikar. We are indebted to the kindness of two Conservators, Mr. Eardley Wilmot in Oudh, and Major Bingham in Burma, for prizes for entomological collections; they have been won by W. J.

• Lane-Ryan and C. E. Allen. The medals have been awarded by the Board of Control as follows :—

• Sylviculture	1	...	...	Hari Keshav Washikar.
• "	2	...	...	C. S. Rogers.
• Surveying		...	...	A. R. Myers.
• Forest Engineering		...	...	C. S. Rogers.
• Botany		...	...	R. Gajaraju Mudaliar.
• Herbarium		...	...	Krishnaji Javadekar.
• Forest Law		...	...	Hari Keshav Washikar.
• Natural Science		...	...	Hari Keshav Washikar.
• Mathematics		...	...	S. Ramaswamiah.
• General Proficiency	Lower			
• Class		...	...	Sham Sundar.

• Our best thanks are due to those gentlemen who so kindly presented prizes this year.

• The School is somewhat unfavourably placed with regard to outdoor exercises. We are only in Dehra for four months in the year, and those months of almost continued rain, which much interfere with cricket and football ; still we had some good matches, and were we able to play more with other institutions, I feel sure the Dehra Forest School could produce teams that would earn laurels for themselves. The athletic sports held in October were very successful ; the chief winners were : Lane-Ryan, Cole, Langhorne, Ethirajulu Naidu, Legge, and Tweedie. At the Volunteer sports of the Dehra Dún Mounted Rifles, the School greatly distinguished itself, Lane-Ryan winning Colonel Harington's cup for the best sportsman, and other prizes being won by Rivett, Jackson, Ryan, Pierce and Tweedie. It was very gratifying that on his recent inspection of the corps, the inspecting General expressed himself so pleased with the turn-out, and the evolutions carried out by the men. We owe very much to Major Leslie Rogers, Captain Armstrong, and Sergeants-Major Ivens, Harris, and Allen for their interest in the School and its Volunteers. I am also pleased to think the Inspector-General and the Board of Control approved of the physical exercise drill of the native students ; the drill is irksome, but I am glad to recognise the improvement this year, and wish to thank Colonel Begbie, 2-2 P. W. O. Gurkhas, for the help of the Havildars who supervised the drill. I regret the gymnasium is not yet built, but hope it will soon be finished, and wish to thank the Government of India for having sanctioned its construction, and giving the cost of the fittings. Our new quarters are now being built, and will be ready in July ; the new hospital will also be ready for use in July. In it our native doctor, who has worked excellently this year, will find himself comfortably provided with accommodation ; we shall now be able to house 80 students, so that it will not be necessary in future to rent as large a number of houses in the town. The health of the men has been good this year, especially in camp ; we were

‘fortunate in being away from the station during the epidemic of cholera that visited Dehra after the breaking up of the Hardwar fair last March. With regard to discipline, I am glad to say the conduct of the students, especially of those of the senior year now leaving us, has been very good. I have nothing more to say, except to express to the students now leaving us, that they have my best wishes and those of the whole School Staff; we shall watch their careers with interest, and hope they will get on, and prove a credit to the Imperial Forest School.”

Mr. Gamble's report was received with loud cheers, after which Mr. Ribbentrop, the Inspector-General of Forests, addressed the students as follows: “Passed students of the Dehra Forest School,—There lie behind you two years of honest hard work to which you can always look back with a feeling of pride, and I trust of pleasure; you are now about to enter upon a practical career in a service the importance of which is constantly growing; I hope you will work in that service with the same zeal that has characterised your studies at this school; if you do so, you will serve your country well. Good solid work in the forests will be demanded of you, for we expect you not only to justify the outlay that Government has incurred in your training, but to conclusively prove the advantages of a high technical training for the Forest Service. I am so impressed with the practical character of the education at this school, a system that has gradually and steadily developed to its present degree of excellence, that I am sure you will be able to do all that is required of you in practical life, and will do it well. No complaint can be made that the character of the examination you have undergone was too stereotyped, or insufficiently searching, for it has been throughout the aim of the Board of Control to ascertain the range and accuracy of your practical knowledge; and in the oral tests if you have not replied to the questions in the form contained in your lecture notes or text-books, it has not necessarily been counted against you, and I think the Examiners have fully succeeded in eliminating cram from the knowledge which you carry away with you from this school. I hope you will manfully bear any work or hardship the Service may demand of you, and will in after life be always a credit to the Dehra Forest School. Let this always be your aim. My best wishes follow you. I hope the junior students will work in class and forest as well as those have done who are now leaving us, and will not leave their hard work to the last few months of their course. You should take a lesson from the oral examination of your seniors; these tests pierce the feeble armour of a crammed mind, for it is only by continuous application to all your subjects that you can satisfy the searching oral tests of the Board of Examiners.

‘Mr. Gamble and Professors, I most heartily congratulate you on the success and development of this school. I feel convinced there is no school of technical education in or out of India where a more practical course of studies is followed. You will

‘ acknowledge, I am sure, that the Board of control has afforded
 ‘ much material assistance in this direction, for which the school is
 ‘ indebted to the originators of the Board, Sir Edward Buck and Mr.
 ‘ Hill. I must not omit to thank Major Leslie Rogers and the offi-
 ‘ cers of the Dehra Dun Mounted Rifles for the great interest they
 ‘ have taken in the Forest School members of the corps, and con-
 ‘ gratulate them on the achievement of results, the excellence of
 ‘ which has been admitted by competent authority. In conclusion,
 ‘ Ladies and Gentlemen, let me express how flattered we are at your
 ‘ kind attendance here to-day, and thank you for it, in the name of
 ‘ the Board of Control, the Professors, the students and myself.”

After loud cheers, Sir Edward Buck presented the certificates to the 34 students of the upper class and 4 students of the lower class, and the various prizes. Of the 38 successful men, 10 were European, and 28 natives; Mr. C. S. Rogers, a private student, was first on the list, and holds the proud position of being the first Englishman that has headed the list for many years.

Sir Edward then addressed the students with the following remarks: “ I have in the first place to express to Mr. Gamble and ‘ the Board of Forest Conservators here assembled, my thanks for the ‘ honour they have done me by requesting me to distribute the ‘ prizes gained by the successful students of the year. I am glad of ‘ the opportunity to make known, if it be not known already, the ‘ very great interest felt by the Government of India in the progress ‘ and success of the Dehra Forest School; an interest not only due ‘ to a desire that the School should in itself obtain the high level to ‘ which Mr. Gamble is bringing it but due to the fact that the ‘ school represents an important policy. That policy is that the ‘ natives of India should share to a much larger extent than ‘ heretofore in the executive administration of the country. The ‘ desire that this policy should receive the fullest possible effect is ‘ not only the desire of the people of India and the Government ‘ of India, but of the people of England. The wish of England ‘ found expression in the Public Service Commission, and it is partly ‘ in support of their recommendations, supported by those of the ‘ Inspector-General of Forests, and the higher officials of the Forest ‘ Department, that the school has during the last two years been ‘ developed, and placed in a more important position. Its staff of ‘ Professors has been increased, its class rooms and museum enlarged, ‘ the accommodation for students increased, and a strong Examining ‘ Board appointed each year, to test the qualifications of the candi- ‘ dates. I venture to hope that the development of the school has ‘ not ceased, and that Mr. Gamble will lead it to still higher levels. ‘ I need hardly remind those assembled here, especially the students, ‘ that those born and educated in the country cannot expect to take ‘ any prominent share in its administration unless they be fitted by ‘ education to fill the more responsible posts which will now, for

‘the first time, be opened to them in the Forest, and other departments. Those of the students who may have felt inclined to think the recent examination severe, must remember that 1898 is an epoch of considerable importance in the history of the Forest Department. Hitherto students trained at Dehra have ordinarily had no prospect of promotion to more than Rs. 100 or Rs. 200 per mensem at the end of their service. Under the new scheme presented to the Secretary of State they will, if they do their duty, be able to rise to salaries of from Rs. 200 to Rs. 350 per mensem; and may, if they do exceptionally good service, obtain Rs. 600 per mensem before they take their pensions. With these enlarged prospects in view, it has become the duty of the Government of India, to support liberally the proposals made by Mr. Ribbentrop, Mr. Gamble, and their advisers, for the proper instruction of the Forest students; it only rests with you, students, to take full advantage of the opportunities offered to you, in order to secure the further sympathy and encouragement of the Government, and to prove to your countrymen that a studentship of the Dehra School is a prize worth coveting.

‘In one respect, independently of its value to the Forest Department, the school has proved, I venture to believe, a useful example to the rest of India. As Mr. Ribbentrop has remarked, it is a signal success as a technical school. I go a step further, and would say that it is a signal success as a practical School. What I mean is this. The student who passes through a technical school is usually fitted only for the technical profession which he is taught at the technical School. But the Dehra School teaching is of such a broad and useful character that I believe its students, that is, the students who pass out of it successfully, would be more fit for any kind of work requiring originality and practical treatment than the students of any School or College in India. It is the only important educational institution in India in which the student is taught more in the field and in the museum than in the lecture room; in fact in which he is taught how to observe, and how to draw conclusions from observation. The consequence has been that the only signal instances which have, to my knowledge, occurred of original research leading to position and useful results being accomplished by natives of India, have been those in which such results have been produced by ex-students of the Dehra School. Only recently the Government of India has been obliged to close apprenticeships attached to the Geological Department, because natives of India could not be found qualified for original research. It is not that natives of India have not in them the necessary qualifications; it is, that the power lies unexplored in them; and has not been brought out by a training in habits of observation, such as you, students, fortunately obtain here. The only regret is that you were not taught these habits still earlier in life. but it is hoped that the

' reforms now being introduced in the educational system of many
' Provinces will remove this reproach ; and that the Forest student
' of Dehra, having been taught the habit of observation from early
' youth, will, as time goes on, not only take a lead in India,
' but will prove the equality of the native of India with the
' educated classes of all countries in scientific investigation and
' research.

' There is another direction, I am glad to say, in which Dehra
' has, in common with other institutions, given a strong lead ; that
' is, in games and gymnastics. I have had the pleasure and satis-
' faction of seeing what the Dehra students, native as well as
' European, can do in this way. All I can say is that they
' can give points to many public schools in England. Well,
' the Forest Officer is of no use unless he can endure physical
' hardship and fatigue, and this is what games and gymnastics
' enable him to do. I intend to include Volunteering in this
' remark ; for it appears from the reports I have had that the Dehra
' Volunteers are among the best in India, and that, they include in
' their number no less 30 students, who, by their constant atten-
' dance at drill during the school season, have earned, it is said, the
' title of ' the nucleus of the corps.' For this result, Major Leslie
' Rogers and his officers deserve our gratitude.

' To return, in conclusion, to your more serious duties, I am
' glad to learn from Mr. Ribbentrop and Mr. Gamble that the stu-
' dents have, on the whole, never done so well as they have this year.
' This is indeed encouraging, for, as it is here indicated, it is on the
' exertions of the students themselves, more perhaps than on the
' labours of their masters, that the future development of the school
' depends. Prove to the Government that the Dehra students
' deserve encouragement, and I can assure you that Government
' will in return do all it can to afford the support which Mr.
' Gamble's excellent management merit. To him, to his staff,
' and to the officers who have come from distant parts of India to
' take part in the examinations, our best thanks are due."

At the close of his speech Sir Edward Buck was cheered vociferously, and cheers were given with hearty good will for the Inspector-General of Forests, for the Board of Control, the Director, Deputy Director, the Instructors, and the ladies. The proceedings then terminated, and the meeting broke up.—*Pioneer.*

APPENDIX ~~SERIES~~

OF

THE INDIAN FORESTER.

FIBRES

USED FOR BRUSH-MAKING.

In this hand-book information as to the chief fibres which are used in India for brush-making has been brought together. The main object in issuing it is, however, to draw attention in England to the fibre (Kittul or Salopa) of *Caryota urens* with a view to the possibility of India becoming a source of supply.

INTRODUCTORY.

In 1888 Messrs. J. Broadhead & Sons, Paint and Brush Manufacturers, sent to Madras from England an assortment of fibres used in brush-making, with a view to gaining information as to any fibres which could be found to compete with any or all of them, and at lower prices. The fibres comprised *Bass* or *Pissava*, *Kittul*, *Mexican fibre*, *Indian whisk*, *French whisk* and *Cocoanut fibre*, concerning which the following details were given:—

"*Bass*" or "*Pissava*"* fibre, which comes to this country from Brazil, is originally in very long lengths and of very varying strengths, and its value at present, as thus imported, is from 30 to 40 shillings per hundred-weight. The dressers of the article steam it, straighten it, combing out rough and refuse, and then cut it and tie it up into bundles (all in the bundle of one length). This is known as "dressed bass." The lengths required in our trade are 5, 5½, 6, 6½, 7, 7½, and 8 inches; also some from 11 to 16 inches for drawing purposes (scrubbing brushes, etc.). Its value dressed is now from 48 to 58 shillings per hundred-weight.

"The stiffness of the fibre is its principal merit; and, had it a greater power of resistance, it would command still higher prices."

"*Kittul fibre*.—The produce of the Kittul palm is used principally for drawing (scrubbing brushes), being bent double to get it inserted into the holes drilled for it. It must be very flexible, and, at the same time, durable. Its value drawn or drafted in lengths (running from 7 or 8 inches to 7 or 8 feet, although the brush-maker does not require it beyond 2 feet) is from 12 to 20 pence per pound, English, according to the length.

"The sample sent was 'oil dyed,' and in this state its value is about one-third less."

"*Mexican fibre*.—This fibre comes from Mexico, and its value, in bales, is from 27 to 32 shillings per hundred-weight. It is dressed or drawn into lengths varying from 8 to 30 inches, and its value is thus about 4½ pence per pound. It is used for 'drawing,' and, occasionally, also for mixing with bristles to imitate them and reduce their quality."

* *Bass* or *Pissava*.—"The produce of two distinct Palms, viz., *Leopoldina Pissava* from Para, and *Attalea funifera* from Bahia." (*Fachson, Commercial Botany of the Nineteenth Century*.)

"*Italian whisk* is used for 'setting' in carpet brooms, etc. Its value is about 4 pence per pound.

"*French whisk* comes to us in lengths of from 10 to 18 inches, and is worth from 8 pence to 16 pence per pound according to quality. It must be very tough (not brittle) for drawing principally.

(This article also comes from South America; but the South America samples are inferior in value to the European.)

"*Cocoanut fibre*, got by bruising the husks of the cocoanut, is also used in brush-making, but it is of lower value than any of the above, *viz.*—

Rough (best English-made)	. . . . .	32s. per hundred-weight.
Drafted	. . . . .	5d. per pound."

In a further letter, in November, 1890, communicated to the Madras Government through the Secretary of State, Mr. W. H. Broadhead urged the desirability of a search for a strong and tough fibre to take the place of the American "*Piassava*" or "*Bass*," which was stated to be, at that time, worth, in the rough state as imported from Bahia, £55 per ton, more or less according to the proportion of stiff fibre and the presence or absence of stones and dirt.

Mr. Broadhead suggested that, "should there be no native fibre to be found in India which could compete by taking the place of this valuable fibre for brush-making purposes, the tree that produces the fibre may very possibly be able to grow in India, and, if so, should be introduced there (either in the form of seed sown or plants put in); and, if these were looked after by the Board of Agriculture, the nucleus of a very lucrative trade would be formed, as the crop would find a very high price in our country, especially if stiff."

In 1888 the Ordnance Officer in charge of the Arsenal, Fort William, wrote to the Agri-Horticultural Society, Madras, stating that, when in Madras two years previously, he had obtained some *Piassava* fibre by sending coolies up the palms for it, and forwarded a sample for inspection. But, in reply, the Secretary of the Society stated that of the fibre-yielding plants enumerated in Vol. IV of Dr. Watt's *Dictionary of Economic Products*, the only one that produces fibre in quality to agree very nearly with the sample sent is *Caryota urens*.

The requirements of fibres for brush-making are stated by Mr. Thompson in a letter to the Collector of the Nilgiris, to be "stiffness and elasticity, i. e., if held between the fingers the fibre or knot of fibres should stand upright, and, if bent or pressed down, should have the power of recovery. Sufficient strength and flexibility is needed to stand drawing into the brush body without breakage. In short, the more nearly fibre, whether coarse or fine, approaches bristles in these characteristics, the more valuable will it prove for the purpose in question."

By means of enquiries instituted by the Madras Board of Revenue information was obtained as to the fibres of the Kittul Palm (*Caryota urens*), Palmyra Palm (*Borassus flabelliformis*), *Cocoa-nut* (*Cocos nucifera*), Screw Pine (*Pandanus odoratissimus*), American Aloe (*Agave americana*), Wild Date (*Phoenix dactylifera*), and Chipurapullalu, Vinapullalu or "broomsticks" (*Aristida setacea*).

These fibres may, together with others, be conveniently discussed *seriatim*.

KITTUL.

(*Caryota urens*.)

The following extract is taken from the *Dictionary of the Economic Products of India* :—

"*Habitat*.—A beautiful palm with smooth, annulated stem, met with in

the forests of the Western and Eastern moist zones. On the Western Ghats it extends to near Mahabaleshwar. In the Settlement Reports of the Chanda district it is stated that this palm abounds in the south-eastern corner of Aheroe, and might, with advantage, be extended to all parts of the district, for it thrives well wherever it is planted. It is common in Burma, Bengal, and Orissa, ascending in Sikkim to 5,000 feet.

"Fibre.—The leaves give the *kittul* fibre, which is very strong, and is made into ropes, brooms, baskets, and other articles. The fibre from the sheathing petiole is made into ropes and fishing-lines" (*Gamble*), and is said to be suitable for paper manufacture.

"At the Colonial and Indian Exhibition (1886-87) much interest was taken in *Salopa* fibre sent from Orissa, Burma, and Kolaba in Bombay. A corset manufacturer applied at the office of the Indian section for a fibre, which might take the place of whalebone in corset-making. He was shown the *salopa* (*kittul*) fibre, and also the similar cord-like fibre from the interior of the stems of the cocoanut and palmyra palms. It was suggested that, if either of these were to be sown in bands into the fabric of the corset, the desired object would be obtained. The idea met with approval, and within a few days the manufacturer exhibited a sample, and expressed the utmost confidence that, if he could procure a continuous supply of the fibre, a large trade might be done. He was referred to the Commissioner of the Ceylon Court, since a considerable trade was being done with that colony in its *kittul* fibre. Shortly after, however, he returned with the report that, while the *kittul* fibre was perhaps preferable for the brush-maker, the softer nature of the *salopa* fibre of India made it preferable for his purpose. These facts are alluded to in the hope of awakening interest in an Indian fibre that has been much neglected. For a good few years past Ceylon has done a by no means inconsiderable trade in *kittul* fibre, but no person seems to have thought of India as a possible source of supply. Since its introduction into commerce in 1860 the uses of *kittul* have greatly extended, and there would, therefore, seem everything to justify the expectation that India might, with advantage, enter into competition with Ceylon. The *kittul*, or as it is called in Orissa the *salopa* fibre, is the cord-like vascular bundles which surround the base of the leaf-sheath. Mr. A. Robottom was the first to introduce *kittul* fibre to European commerce. That gentleman is reported in *Spon's Encyclopædia* to have stated that Indian is inferior to Ceylon *kittul*. At the Colonial and Indian Exhibition he pointed out a sample of the much inferior *kittul*-like fibre from *Arenga saccharifera** as the *kittul* he had formerly seen as sent from India. He admitted that the sample of *salopa* shown him at the Exhibition was as good as any he had ever seen from Ceylon, and seemed confident that a large trade could be done in the Indian fibre.

"It is commonly reported that, in Ceylon, the black fibre from the leaf-stalks is manufactured into ropes which are of great strength and durability, being used for tying wild elephants. A woolly material found at the base of the leaves is sometimes used for caulking ships in Burma. In some parts of India the cord-like fibre from the stem of this and other palms is employed as a bow-string or as a fishing line. (*Royle, Fib. Plants.*)"

A writer to the *Madras Times* (November, 1891) pointed out that the best fibre in Ceylon is extracted from the leaf-stalk, and stated that "the *pinna* or side-stalks also afford a good but rather shorter material, and, if we are about to compete with Ceylon in the production of this fibre, we must not content ourselves with gathering the loose reticulations alone,

* The Sago palm of Malacca and the Malaya.

but proceed to extraction from the leaf-stalk. As this tree has a very large leaf indeed, the midrib or rachis being from 18 to 20 feet in length, it is obvious that a very long fibre can be obtained from it. In Ceylon the fibre is graded from 0 to 3, that is to say, there are four different grades of the fibre, and they are sold at different prices; 0, the longest, is from 8 to 9 feet in length, and fetches Rs 45 per ton in Colombo; 3, the shortest, about 12 inches in length, can be had for Rs 20. As we before stated, the fibre is prepared by a wild tribe of Kandyans, known as 'Rodyahs,' and is brought down by them in the rough to Colombo, where it is sorted into grades according to length, as length is the chief factor in the value of the article. All these points should be taken into consideration; and, if those interested in the production of this fibre will only learn the method of extraction from the leaf, it will be found that the trees all afford a most plentiful supply of excellent material; each leaf will give two or three pounds of it. The lower and stronger leaves alone should be taken, and at certain periods the lowest range of leaves on the trees turn downwards and present their points to the gatherer, and they are also then readily detachable from the parent stalk, and can be harvested with a minimum of trouble. They should be gathered before they dry on the tree. A very slight soaking is sufficient to remove the gummy portions, and the fibre can be readily separated by hand and comb. This can be easily seen in a dry leaf in which the gum, etc., has disappeared from natural causes; the remaining fibre is exposed in a skeleton form and demands no trouble for separation, and no machinery. There is no reason why this fibre should not be collected in great abundance, and sold at very reasonable rates."

Mr. John R. Jackson in his *Commercial Botany of the Nineteenth Century*, 1890, says with reference to the trade in kittul: "When first imported the finer fibres were used for mixing with horse-hair for stuffing cushions. As the fibre is imported, it is of a dusky-brown colour; but after it arrives here (in England) it is cleaned, combed, and arranged in long straight fibres, after which it is steeped in linseed oil to make it more pliable; this also has the effect of darkening it, and it becomes indeed almost black. It is softer and more pliable than *Piassaba*, and can consequently be used either alone or mixed with bristles in making soft, long-handled brooms, which are extremely durable, and can be sold at about a third the price of ordinary hair-brooms. The use of kittul fibre is said to be spreading not only in this country, but also on the Continent."

A circular was sent, in the latter end of 1891, by the Officiating Reporter on Economic Products, to the Directors of Agriculture, and Forest Officers in various Provinces, asking for as full information as might be possible on the following points:—

- (1) Whether *Caryota urens* is abundant.
- (2) The estimated quantity of fibre that may be annually available for export.
- (3) Whether the supply could be increased, if a profitable demand for it arose in England.
- (4) The nearest seaport or railway station to which it could be sent, and the wholesale price per ton at which it could be landed there.
- (5) The month in which the fibre could be gathered and exported.

The information acquired by means of this circular and the enquiries of the Madras Board of Revenue is embodied in the following *procès* of letters.

General McLeod, Inspector General, Ordnance Department, Madras, reported in 1891 that Kittul fibre has been largely used for the manufacture of horse-scrubbing and carriage-brushes by the Ordnance Department, but, though the tree is found in quantities on both the east and west coasts of the

peninsula, he was not able to procure a local supply, though he made every effort to do so. The fibre used at present in the Ordnance Department is all obtained from Ceylon, where it is an article of considerable export. There is no reason whatever that it should not be obtained in this country, if a little enterprise were brought to bear on its production, as it is easily extracted and without destruction of the tree.

General McLeod's successor has reported, more recently, that the manufacture of kittul horse-brushes is being discontinued, as officers commanding mounted corps in the Madras Presidency have condemned the brushes after a lengthy trial. There seems no doubt that fibre suitable for brush-making could be obtained, but it apparently requires special selection and treatment.

From the Collector of Vizagapatam, Madras :—

Vizagapa-
tam District.

Bastard Sago Palm.—Its collection in Vizagapatam is altogether a question of price. Isolated trees are to be found everywhere, and they are decidedly numerous in parts of the Pottanghi and Paderu taluks and on some of the slopes of the Ghats. The trees have, however, to be climbed to gather the fibre, and, as only a small quantity can be obtained from each, collection would not be remunerative unless the prices are fairly high. I would suggest that the market price should be ascertained, and I should be authorised to endeavour to collect a few hundred-weights of it at a little less than this rate. If this is done, I will ask the Maharajah of Viziahagram to allow the Manager of his coffee estate at Anantagiri to endeavour to arrange with the hill-people, who attend the weekly fair there in large numbers, regarding the collection of the quantity wanted. They bring large quantities of all sorts of hill produce to this fair, and would, I am sure, quickly take the matter up if they found it paid them.

The Collector of Vizagapatam has made over samples of fibre to the jailor, who is anxious to do what he can in the way of brush-making, and specimens will be furnished when he has acquired experience in dealing with the rough material.

Specimens of fibre were sent to the Inspector General of Ordnance, Madras, who wrote as follows with reference to them :—

The fibre sent is hardly what is required, one sample being much too coarse and the other too fine. For Kittul fibre No. 1 the rate now paid is Rs 45 per cwt. delivered in Ceylon, but, unless it could be supplied at a more favourable rate, it would be hardly worth while changing the present source of supply. The requirements of this Department would be about 2 tons annually; but the Transport Department has taken up the use of Kittul fibre for grooming mules, and the Commissary-General is also anxious to obtain supplies of good fibre locally, so it is probable that the demand will increase as time goes on.

From Mr. P. Thompson, Coonoor Brush Factory, Nilgiris, Madras :—

Coonoor
Factory.

Kittul.—This is by far the best fibre for brush-making that has as yet come before me. It is flexible and, at the same time, has stiffness and elasticity. By grading or sorting it can be used for various classes of brushes. The coarsest, it appears to me, would be a substitute for Piasava for bass brooms, while the finer can be used for other descriptions of brushes. Although the palm grows freely on both the west and east coast of this Presidency and is used for toddy, no one has, as yet, collected the fibre in any quantity, and I have had, up to the present, to import my supplies from Ceylon. It is there found to be a profitable article of export, and I would suggest that it might be worth while for Government to

institute inquiries of the authorities there as to the cultivation of the palm.

The following information was supplied, through the Collector of Malabar, Madras, regarding the *kittul* fibre procurable in that district :—

Malabar
District.

(a). NORTH MALABAR.

Roughly there are about 3,000 palms in the reserved forests and lands of this division, chiefly in the Kannothe and Periya ranges, but the trees are scattered all over the interior of the forests and not very accessible. Besides this, a great number of ryots have two to five palms near their houses, from which they extract toddy and get their fishing lines.

About a ton and-a-half of fibre can be collected from the trees in the reserve forests. It is difficult to estimate the quantity the ryots can produce, as they do not collect it for sale, nor are they skilful in doing it. The supply could be increased, as the palm is hardy and the seeds germinate freely.

The nearest seaport and railway station are Tellicherry and Nanjangod (in Mysore), respectively. As the Natives are quite unaccustomed to the work, at present a ton of fibre will cost about Rs.2,250 at Tellicherry and Rs.2,260 at Nanjangod.*

The fibre could be gathered at any time, but most conveniently from October to May. The ryots say that the fibre can be collected from trees 15 years and older, that the life of the palm is about 50 years, and that on an average two leaves with their sheathing petiole can be cut in a year, and that each leaf-sheath will yield about half to three-quarters of a pound of fibre.

(b). SOUTH MALABAR.

There are 100,000 trees more or less in this division. Excepting Calicut taluk the Tahsildars put down the number as 85,100.

Four leaves can be annually cut from a palm without causing any injury, and, taking $\frac{1}{16}$ lb of fibre as the outturn from a leaf, there will be an annual produce of 25,000 lb of fibre, or about 11 tons.

When a good price is given the people of Malabar will take themselves to the cultivation of *Caryota* as ardently as any other, and in course of time (a decade is ample) a very large quantity of Kittul fibre can be annually exported and a large trade done.

Caryota urens is grown everywhere, but it grows best in red soil. Not less than 400 can be planted in an acre, and the first leaf can be cut and fibre taken when it is about 8 to 10 years old. It may live for 25 to 30 years when left alone, but when leaves are cut annually, as it will have to be cut for taking out fibre, it will not last more than 20 years, and each palm will therefore be serviceable from 10 to 12 years only. It is best to collect black fibre, as the leaves are immature when the fibre is white, and the cutting of immature leaves will be injurious to the palm, and it dies away sooner.

Samples of fibres from Malabar were forwarded to the Inspector General of Ordnance, Madras, who reported that the sample from Kottayam taluk appeared to be a good one, and that the other samples were unsuited for Ordnance Department requirements, though it was thought that those labelled "Ernad" and "Walawanad" might be much improved by dressing and selection.

* It may be assumed that the cost of collection of the fibre would be considerably diminished with an increase in the demand for it and with systematic collection.

Kittul, Madras.

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Abstract of information regarding Kittul fibre that may be gathered in the district of Malabar.

Taluk.	Number of palms producing fibre in each taluk.	Estimated quantity of fibre available for export in a year.	Whether the supply could be increased, if a demand for it arises.	The nearest seaport or railway station to which it could be sent, and the wholesale price per ton at which it could be landed there, as reported by the Tahsildars and District Forest-officers.	The month in which the fibre can be gathered and exported.	REMARKS.
1. Chirakkal	1,000	1,000	No, because people are averse to cultivate it, as the cultivation of coconut, etc., is more profitable.	Port Cannanore, Rs. 3,360.	Can be gathered in March and April, and exported in April and May.	The Tahsildars of Wynad, Ernad and Waiyanaid report that three kinds of fibre can be gathered. Ponnal Tahsildar reports that two kinds of fibre can be gathered. Palghat Tahsildar reports that no fibre can be gathered in that taluk.
2. Kottayam	450	60	Do. do.	Port Tellicherry, Rs. 4,480.	Can be gathered in March and April, and exported in April and May.	
3. Karumbraiad	3,050	500	Do. do.	Ports Badagara and Qulandi, Rs. 2,240.	Can be gathered and exported in April-May.	
4. Wynad	12,500	6,300	Yes, if a reasonable price is obtained.	Ports Tellicherry and Calicut, Rs. 1,400.	Can be gathered in January and February, and exported in March and April.	
5. Calicut	12,000	600	Do. do.	Railway stations Ferok and Calicut, and port Calicut, Rs. 500 to Rs. 7,460.	Can be gathered in December and January, and exported in April.	
6. Ernad	20,000	2,000	Do. do.	Railway station Parpanangudi and Tirur, Rs. 300 to Rs. 600 for black fibre, and double the price for white fibre.	Can be gathered and exported from November to May.	
7. Waiyanaid	25,000	6,350	Do. do.	Railway stations Pattambi, Ottapalam and Lakkad, Rs. 300.	Can be gathered and exported from December to May.	
8. Ponnal	40,000	2,000	No, because palms are used for the more profitable trade of toddy drawing.	Port Ponnal; railway stations Tanur, Tirur, Edappalam, Kuttippuram and Pallipuram on the South-west line, Rs. 3,000.	Summer season.	
9. Palghat 10. Reserve Forest, North Malabar.	100 3,000	2,240	Yes	Port Tellicherry and Nannjengod in Mysore, Rs. 2,560.	Can be gathered and exported from October to May.	

Godavari
District.

From the Collector of Godavari District, Madras :—

Caryota urens is found on the Rekapalle hills, but is believed to grow more freely in Rampa, which tract, however, has never yet been visited by a Forest officer. The quantity of fibre that may be annually available for export is estimated at 1000 or, perhaps, more. The District Forest officer is of opinion that much greater quantities may be procured from the Rekapalle range, and says that the best and greatest quantity is extracted from the leaf-stalk. The supply could, probably, be increased if more attention were paid to it, and the trees reserved. Coconada is the nearest sea-port to which the fibre could be sent. The fibre may be gathered and exported during any season of the year.

Ganjam.

The Collector of Ganjam reported that *Caryota urens* grows freely in Gumsur, and, though at present restricted to situations near villages where it has been planted, its cultivation might be extended with ease, and suggested that experiments should be carried out with a view to determining the possibility of obtaining the fibre at a remunerative price.

The Khonds regard the palm with much affection, as it supplies them with their favourite beverage.

Coimbatore
District.

The Collector of Coimbatore, Madras, reported that *Caryota urens* is not found in abundance in that district, but that it is abundant in the adjoining Cochin and Travancore Forest limits.

South
Canara.

From the Collector of South Canara, Madras :—

The palm, which is locally known as "baini mara," is not abundant in South Canara. It is, however to be found in almost all parts of the district but in a scattered condition, and is not very abundant anywhere. It is essentially, like other palms and canes, a tree of the dense, moist, and evergreen parts of the forests, outside which it is seldom found except in gardens and groves, being, in fact, cultivated or, at least, favoured by the people. There is no trade in the district in the fibre, which is only extracted by individuals, as wanted, for fishing lines and for sewing leaf-caps, umbrellas, etc. The District Forest officer reports that the fibre can be got only when the tree begins to flower, as the sheath then becomes hard and brittle; that the removal of the leaves meanwhile is detrimental to the yield of toddy; and that only $\frac{1}{10}$ of fibre can be got from one sheath, and that by a day's labour, so that the cost per ton amounts to about Rs. 1,680. If arrangements for its collection were made, the annual quantity that may be expected from the whole district may be roughly estimated at about a quarter of a ton. The District Forest officer considers that the supply could not be appreciably increased, even if a real trade in the fibre could be started, that nothing in the way of Forest cultivation is feasible, and that collection would tend to make the tree scarcer. In these views I concur under present circumstances; but, of course, in a district like this, well suited to the growth of the tree, the extent of its cultivation depends solely upon the demand for its produce and the price procurable for it. Should a demand for the fibre, rendering its cultivation profitable, spring up, doubtless the cultivation of it would rapidly extend.

The fibre can be sent down to all the sea-ports in the district, whence it can be transported to Bombay. Assuming the cost of collection to be Rs. 1,680 per ton, transport to the coast and freight to Bombay might possibly increase the cost by about 10 per cent., which would bring the price of a ton up to Rs. 1,848, or roughly Rs. 1,850 at that port.

The month in which the fibre could be gathered and exported is March.

From the Assistant Conservator of Forests, Kurruck Division, Bengal:—

Bengal.

The process of extraction of the fibre, as far as I can make out from a Ranger's report, is as follows:—

The outer skin is cut at the so-called knots, and taken off. This is then well pounded with a hammer (of wood probably). After that it is soaked in mud (under water) for two weeks, and, when the cells have rotted, the fibre is collected and used. They also use the thicker part of the stem, cutting it right through at the knots, splitting up the blocks, and proceeding as before.

The fibre is very seldom used in this district, and very few people know that the plant gives a fibre for cloth-making.

From the Deputy Conservator of Forests, Teesta Division, Bengal:—

The plant is, I believe, abundant in this division and occurs in most places, usually on the banks of rivers where the ground has not been cleared for cultivation. Seedlings of the trees are numerous, but, owing to the dense undergrowth of the forest, are not readily found. Big trees are scarce as, in all easily accessible places, they have been cut by Lepchas, who eat the pith as food. To attempt an estimate of the quantity annually available would be misleading. If a profitable demand arose for it, Mr. Lister, who has grown some trees, informs me that it can be easily grown from seed, and requires little or no attention. Some trees felled by him in 1884, which I saw at Nimbong, are 4'10" in girth and over 20' in height. He writes to me as follows: "Carriage is so expensive in the hills that we have little chance of competing with districts favoured with cheap water-carriage, and this palm seems to have a wide range from Nepal to Burma."

The nearest station at present is Silliguri, and the cost of carriage per ton would certainly not be less than Rs. 14.

I understand that the fibre is obtained from the sheaths. The most convenient time for collecting and exporting would be from October to June. During the rains work would have to be suspended entirely.

The Assistant Conservator of Forests, Angul Division, Bengal, reported that *Caryota urens* was once very abundant in that division, but that, during the late scarcity, the trees were all cut, and the pith used as food by the poor-aborigines. As the matter stands at present, it is difficult to reckon on any appreciable supply of fibre being collected.

The following note on the occurrence of *Caryota urens* in the Bombay Presidency was supplied by the Director of Agriculture:—

Bombay
Presidency.

The only part of the Presidency where *Caryota urens* is found in any abundance is the Southern Division of the Kanara District, the estimated productive area on the ghats being 228 square miles, exclusive of scattered patches in the east, the area of which is unknown. In the Northern Division of the district it grows in a few inaccessible places in, the Supa and Karwar Talukas. It is also found scattered in groves in the moist evergreen forests of the Western Ghats and Mátheran. It is more common in the southern portions of this Presidency than north of the Kolhapur State. The Mokhada Petha of the Tháná District is said to be suited to the growth of this palm. The number of trees now found there is estimated at 500, but this the Conservator of Forests, Northern Circle, considers an under-estimate.

The palm does not grow in Sind.

Only well-grown mature trees give the proper quality of fibre: from old trees the fibre is brittle and difficult of extraction. The trees arrive at maturity in about 20 years, and can be stripped of leaves for the next five years, i.e., till they begin to flower and are tapped for toddy; they then exhaust themselves and die in a few years. Only a very small portion of the fibre of each leaf is thick enough to answer trade purposes.

The leaves are cut and left to dry for one day, and the fibre is picked out by hand from the leaf-stalk. The Divisional Forest Officer, Southern Division, Kanara, states that during the five years of fibre production only two leaves can be stripped annually, each leaf yielding one ounce. He estimates that 1000 trees could be annually stripped, which will thus yield about one cwt. of fibre. According to the Forest Officer, Northern Division of Kanara, the palm produces yearly three new leaves, yielding about 4 ounces of fibre.

A second source of fibre is the fruit-stalk, obtained from trees not tapped for toddy. In Poona and Satara the stalks themselves are used instead of cocoanut twine for tying thatched roofs. In Poona a fibre is extracted from these fruit-stalks after they have been rotted in water for a month. About 1000lb of fibre, apparently in the form of fruit-stalks, can be collected in the Mokhada Petha of the Thaná District.

The supply of fibre could be increased, but it would be at the expense of the Abkari Revenue, which is considerable. It is said that the yield in toddy would be diminished if the trees were stripped of their leaves. Last year tapping fee at the rate of Rs 3 per tree was collected on 4,175 trees in the Sirsi and Siddapur ranges in Kanara.

In the Mokhada Petha of Thaná the number of trees could be considerably increased by sowing and plantations in the course of a few years.

Kumpta and Honaver are the nearest seaport towns for the export of the produce of the Southern Division of Kanara. The wholesale approximate price per ton at which the fibre could be delivered on the spot is Rs 2,240, being calculated experimentally thus:—

	R	s.	p.
Wages of a man to climb six trees for twelve leaves for 12 ounces of fibre	.	.	0 4 0
Wages of two men to separate the fibre from the leaves	.	.	0 8 0
TOTAL	.	.	0 12 0

Thus 12 oz. of fibre cost 12 annas and a ton Rs 2,240. To this will have to be added the charge of conveyance to the ports of shipment, say, Rs 11 per ton. The fruit-stalks produced in the Mokhada Petha of Thaná can be delivered at the Kasara Station on the Great Indian Peninsula Railway line at probably an average charge of Rs 20 per ton.

April is said to be the proper time for gathering the fibre in Kanara, while in Thaná the fruit-stalks can be gathered in November and December.

Burma.

From the Conservator of Forests, Pegu Circle, Burma:—

Caryota urens is fairly abundant in the Zeyawadi range of the Toungoo Division, and east of the Sittang river in the Shwegyin Division. In all the other divisions it is very scarce.

In Toungoo it is considered that 2,000lb might be obtained, but it is believed that stripping the trees would kill them, and that no annual supply could be expected. From Shwegyin it is reported that no estimate can be framed as, although the tree is plentiful in the localities named, its fibre is never extracted for sale.

The supply could, no doubt, be increased if a demand for it arose which was profitable enough to induce the people to plant trees. The fibre, if extracted, would be sent to Rangoon. It is almost impossible to estimate the cost of delivery. It would probably be not less than Rs 50 per ton, which is about the cost of *Sterculia* fibre.

The fibre could be gathered and exported from November to March.

The following report was received from the Deputy Conservator of Forests, Upper Burma:—

There are two kinds of *Caryota urens* in this division, known by the Burmans as *Minbaw gyi* and *Chouk mindaw*.

Minbaw gyi is large, and the leaves are in proportion. The fibre is

much coarser than that yielded by *Chouk minbaw*, and is not at all prized by the Burmans. It is not very plentiful.

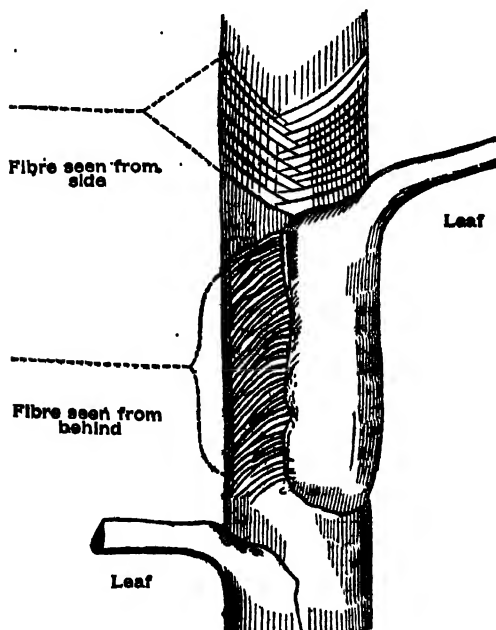
Chouk minbaw produces a very good fibre, which is used to a certain extent by the Burmans for making ropes for well, buckets, as it does not easily rot. The tree is fairly plentiful in the division, and is spread over the whole division to a greater or less extent. The Burmans and Sháns do not use the fibre to any great extent, and any attempt to get it produced for export would have to start *ab initio*, and would be a new industry entirely. At present the method of obtaining it is very wasteful. The tree is cut down, and a few of the leaves are used. The prices that would have to be paid are very high. For the separated fibre Rs 1 to Rs 1.4 per viss would have to be paid to enable the workers to earn 8 annas per day. If the dried leaves were collected and exported, the price would be much less. A supply would no doubt be forthcoming if there was a regular demand for it at remunerative prices. It could be brought to Mandalay at present and later on to Katha and stations along the Mu Valley State Railway line.

CEYLON KITTUL

The following note is taken from a recent communication from the Colonial Secretary, Ceylon, to the Madras Government :—

Ceylon.

The Kittul tree is generally most prized for its sugar and toddy-yielding qualities in Ceylon. The collection of the fibre is, as a rule, delayed until the tree has flowered and begun to yield sugar and toddy. In places where the fibre is collected from young trees three or four years old, the fibre sometimes commands a higher price in the market, but the tree is ruined.



The process of removing the fibre is as follows : The fibre collector takes a sharp knife and climbs up the tree till he reaches the base of the "crown" and there selects a leaf that affords a sufficient hold or footing from which to commence operations. The fibre in itself forms a strong connecting tissue by which the base of the leaf-stalk of the palm is held to the tree, much after the manner shown in the annexed sketch, and in order to support the leaf is closely folded upon the body of the plant long before the leaf itself is fully formed. The operator introduces the point of his knife under the fibre midway between the two edges of leaf-stalk and severs the tissue, pulling the leaf as he does so outwardly and downwards till it detaches itself from the tree. After removing as many leaves as will yield mature fibre, the operator descends and proceeds to cut the fibre off the leaf-stalk, and the whole is then picked over by hand and combed till it is free of any woody or other foreign matter, and finally put off into bundles each about 2 feet long and 4 inches wide, tapering at both ends into a point. The quantity of fibre depends greatly on the age or size of the tree. In a young tree that has not flowered, the largest quantity appears to be present, and is said to be as much as 4lb when clean ; but again, in very young trees, not more than 6 feet in height, a greater quantity can be obtained by taking all the fibre round each stalk-base till the heart or "cabbage" is reached, but the *quality* is inferior and the plant is killed. In this way the collectors of Kittul fibre (Kenddi) kill a large number of palms yearly, to the great loss of the "Wahampuriyo" (toddy and jaggery-makers) who depend on the Kittul to afford them a means of living.

The price paid by traders in Kittul is said to be from Rs to Rs 12 per cwt.

AMERICAN ALOE.

(*Agave americana*.)

Habitat.—Originally a native of America ; naturalised in many parts of India. Extensively used for hedges to protect railways.

Mr. Thompson recorded his opinion that the fibres of various varieties of *Agave* are all more adapted for weaving than for brush-making, not being so good even as coir. In his brush factory on the Nilgiris Aloe fibre, prepared from *Agave americana*, purchased in the Coimbatore bazar, is used.

Lieutenant-General H. McLeod reported that he believes *Mexican* to be the fibre of the American Aloe (*Agave americana*) which grows plentifully everywhere, especially along the railway lines, and that he used this fibre twenty-five years ago to mix with hog bristles in making horse-brushes to reduce the cost of the brushes.

In an article on brush-making fibres of India (*Indian Agriculturist*, December 12th, 1891) it is stated that "Mexican" is produced in South America from the American Aloe (*Agave americana*), and is very largely used in brush-making. It is a white lustrous fibre, strong, elastic, and durable, and is used alone to make white brushes, and, in combination with bristles, to make the white lines that are seen in many brushes ; and again, dyed black, it is used with bristles mixed in the tufts to reduce the cost of brush-making, as it is very much less costly than bristles are, the best hog bristles fetching as much as 7s. 6d. per pound in the London market. This is the quality known as 'lily,' and is a white lustrous bristle, while its imitator, the 'Mexican'

* Mexican fibre or lisle is the fibre of *Agave heteracantha*.

Mexican whisk or Broom-root is the fibre of *Epicampes macroura*.

fibre, does not cost more than £30 or £25 per ton, that is, 2 to 3 pence per pound. Prices, however, of this fibre are also rising, and a good quality of it will probably fetch £30 per ton. This fibre should be very easily procurable in India, as the American Aloe grows everywhere, and has been used already for fine fibre. But, as now we want a stout fibre approaching, as much as possible, to the texture and quality of hog bristle, the methods previously used for the extraction of weaving fibre from this plant would probably not be successful in producing a good brush material. The most mature leaves should be selected for treatment, and it is very probable that the tall flower stalk would also yield a very valuable material, as it would be much longer in staple, and length is a very important factor in regulating the value of brush-making fibres. There is a good deal of gummy matter, which would have to be removed if the fibre was meant for weaving, but which is much better left where it is to a large extent, if the fibre is intended for brush-making purposes, as the gum lends stiffness and elasticity to the fibre—qualities that are much desired in this connection. It is obvious, therefore, that maceration in water should be avoided in this treatment, and some such process as drying the leaves and beating them dry is much more likely to produce a good stiff fibre. Of course a comb would be required to remove ragged ends and superfluous matter; but, if these fibres are carefully prepared and bundled in lengths, there is but little doubt that either or both of them might successfully compete with Mexican on the London market."

The Calcutta brush-makers import Mexican fibre (called in the vernacular *reju*) from England, and say that the fibre of *A. americana* has not sufficient glaze to be as useful as Mexican.

PALMYRA PALM.

(*Borassus flabelliformis*.)

Habitat.—Cultivated throughout tropical India, and beyond the tropics in Bengal and the southern part of the North-West Provinces.

Lieutenant-General H. McLeod reported that "an excellent substitute for *piasaba* is used by the Ordnance Department in this (Madras) Presidency, which is obtained from the Palmyra palm. It is, in my opinion, quite equal to Brazilian *piasaba*, and can be obtained in the lengths mentioned by Mr. Broadhead. The Superintendent, Gun Carriage Factory, would be able to supply samples and prices."

A writer to the *Madras Times* (November, 1891), says that a very good fibre can be extracted from the leaf-stalk of the Cocoa palm and Palmyra palms, not so long but quite as strong as the Brazilian *piasaba*, and if carefully extracted in its extreme length, sorted in bundles, and dyed brown the colour of *piasaba*, would certainly fetch a good price in the London market.

In January, 1892, the Inspector-General of Ordnance, Madras, reported that the Palmyra fibre, used at the Gun Carriage Factory, Madras, in lieu of *piasaba*, was obtained by local purchase at the rate of ₹1 per lb, and was found to answer. Sometimes it has been received so flexible as to be unsuitable, and, at other times, brittle, but fibre of this nature has always been rejected. *Piasaba* brushes for guns of large calibre have been made, and found suitable.

The Deputy Collector of Madras reported that Palmyra fibre is brought into Madras from the Chingleput District, where the palm is very abundant. The fibre is received in a very rough state, and requires considerable treatment before it is fit for use. He also stated that he understood

that the Palmyra fibre used for brush-making is imported from Ceylon, as the fibre produced locally is not suited for the purpose.

The following information relative to the preparation of Palmyra fibre as carried out in the Salem District, Madras, was supplied by the District Forest Officer :—

The fibre is obtained from the stalks of the leaves, which are usually taken from the tree soon after the toddy-drawing season. The leaf-stalks, when in a green state, are beaten with a wooden mallet on a flat granite slab. The surface or outer fibres are then separated, and reserved for making strong ropes. The inner fibres, well separated from the non-fibrous tissue by being rubbed between the hands, are combed with a wooden comb or beaten on the ground, and are then ready to be worked up into ropes or to be used in the raw state for binding the roofs of thatched houses. It appears that the maximum yield of leaves from one tree in a year is ten, and that the ten leaf-stalks will produce about 1 lb of fibre, which it would take a man or woman a whole day to prepare. Thus the average yield of fibre per tree per annum may be set down at from $\frac{1}{4}$ to $\frac{1}{2}$ of a pound. This, however, is not a district like Tanjore and Tinnevely in which Palmyras are numerous. Doubtless if a foreign demand for the fibre was to spring up at a price somewhat higher than the local cost of production, which is about $2\frac{1}{2}$ annas per lb, a considerable quantity might be available for export.

Palmyra fibre is exported to Ceylon from Pámban, a town on Rámés-varam Island in the Madura District, Madras.

The following information as to the trade in, and method of preparation of, the fibre was obtained from a report by the Head Assistant Collector of the Madura District :—

Pámban is the only place in this division in which the trade is carried on at all. Its existence there seems to be largely due to the efforts of the agent of a firm in Colombo who has been actually engaged in encouraging the natives of the island to prepare and sell to him the fibre. 'It is with great difficulty that he can induce the people to undertake an industry that is new to them and was not practised by their forefathers, and in many instances instruction in the method of preparing the fibre and even advances of money to be repaid in fibre were not productive of much extension of the trade. Were it not for this difficulty, the quantity available in this division would be very large, as Palmyra trees grow in great numbers in every part of it. This might, however, be surmounted if instruction as to the method of preparation of the fibre and information as to the high price it fetches were sufficiently disseminated. The present price in Pámban Island is Rs 10 a hundredweight.

The method of preparation simply consists in detaching from the trunk of the Palmyra tree the lower part of the stalk of the leaf which remains clinging to the tree after the leaf has been cut off or died, beating this with a wooden hammer, and pulling out the fibre which is so detached. The best trees for the purpose are young ones from 12 to 15 feet high, as in these there are usually more of these leaf-stalks attached to the trunk. They fall off as the tree gets older. The stalks require to be of a certain and particular state of decay, in which the fibre in them when hammered out will be of a black colour. The white fibre which is obtained from immature stalks is less pliable and more brittle, and fetches an inferior price in the market.

As explained above, the quantity which would be available in this division depends less upon the number of palmyra trees here than upon the

extent to which the people could be induced to undertake the industry. Palmyras abound everywhere along the coast, and were sufficient hands available the supply would be very considerable, but at present, and for these reasons, no more definite information can be given than that 158 cwts. have been exported from Pámban alone since April in this year, and that the industry there is still a new one capable of improvement.

In a letter from Messrs. Ide and Christie, June, 1892, to Mr. D. Morris of the Royal Gardens, Kew, it is stated that the first arrivals of this fibre took place about a year ago, the scarcity and high values of Brazilian Piassava having induced the production and shipment of substitutes. The early imports realized from 36*l.* to 42*l.* per ton, against West Coast African Piassava 55*l.* to 65*l.*, but with fuller supplies of these brush-making fibres (including split bamboo) market values have receded, and Palmyra ranges to-day from 22*l.* to 33*l.*

The chief objection to Palmyra by manufacturers is that it lacks straightness, but experiments are being made in this country to overcome this defect, and should they prove successful it is claimed by importers and dressers that Palmyra should, for wear, then, be found equal to the best Brazilian.

SCREW-PINE.

(*Pandanus odoratissimus*.)

Habitat.—Frequently planted on account of the fragrancy of its flowers, but wild on the coasts of South India, Burma and the Andamans. Found abundantly in Bengal and Madras.

The Superintendent of the Madras School of Arts reported that the aerial roots are commonly used by painters and white-washers.

It has been suggested (*Indian Agriculturist*, December 12th, 1891) as probable that a very good substitute for Mexican might be extracted from the aerial roots of this pine, which grows in great profusion on all the backwaters of the west coast, and is stated that these roots are habitually used by the natives as whitewashing or *chunaming* brushes. The only simple process they put them through is to cut off a piece of the root of the length they want for a brush, and bruise out the fibre at an end to the extent of two or three inches, and the brush is at once ready to hand. The remarks made with reference to the retention of the gummy matter in the case of *Agave americana* apply also to the fibre of the Screw-pine.

COCOA-NUT.

Habitat.—Cultivated throughout tropical India and Burma, especially near the sea coast. On the eastern and western coasts it is more particularly abundant, more so towards the south.

Mr. Thompson, Coonoor, reported as follows:—

"I have used this to some extent, and it is, as I know, used in England to a considerable extent for ordinary household brushes. It requires to be selected with some care, as only the stiffer fibres are suited for brush-making. These could, I think, be taken, and the rest of the fibre still be equally good for the ordinary use of coir.

"Cocoa-nut fibre should, it is said, be selected, well carded from both ends, and the stoutest and longest fibres bundled together. Mr. Brougham, in the note already referred to, states that it requires to be carefully manipulated and sorted. Frequent washing and beating greatly

improve the quality of the fibre, and under this process it appears to attain a certain amount of elasticity."

The District Forest Officer of South Arcot in the Madras Presidency reported that any quantity of prepared fibre can be obtained from Cuddalore by giving prior notice to the manufacturers, who are chiefly women of the fisher caste living along the coast. The price of a pound of prepared coir is nine pies and of fibre about six pies. The method of preparing the fibre is described as follows: The fibrous rind which thickly covers the unripe cocoanut is separated in segments of halves and quarters and steeped in pits of salt-water along the low-tide mark of the back waters, and left there to rot for about a fortnight, after which it is taken out and beaten with a wooden mallet until a greater portion of the pithy husk adhering to the fibre is separated. It is then well washed and dried so as to be fit for conversion into ropes, brushes, etc.

In the *Scientific American*, August, 1892, in a note on the manufacture of brushes from coir on Rhode Island it is stated that the best fibre is obtained from some of the islands grown on the coast, while that produced by the trees on the main land, for the lack of salt water apparently, is much inferior, and many devices are designed by the natives to make this fibre simulate that of the island, so that they may obtain a corresponding price in the market.

CHUSAN PALM.

(*Chamserops fortunei*.)*

Attention is called in the *Indian Agriculturist*, December 12th, 1891, to the value of the fibre of this palm, which has been successfully introduced on the Nilgiris, for brush-making. "It grows," the writer says, "to a height of 10 to 15 feet, and the whole of the trunk from the ground up is clothed with a thick mass of fibre, which can be easily removed by hand, and only needs to be combed out and bundled in lengths to be a most valuable article. It is a plant that would pay well to cultivate, as it gives off an immense quantity of fibre for the mere trouble of gathering. It is admirably adapted for cultivation on the Nilgiris or other hills of Southern India."

Mr. M. A. Lawson, Government Botanist, Madras, reported that *C. fortunei* could be grown to almost any extent on the Nilgiri hills, and most profitably at elevations ranging from four to six thousand feet; that it is of slow growth, and that the amount of fibre yielded by each tree is somewhat small.

WILD DATE.

(*Phoenix sylvestris*.)

Habitat.—Indigenous in many parts of India, being most abundant in Bengal, Behar, on the Coromandel Coast, and in Guzerat. It also forms extensive forests in Rohilkhand, on the low ground along the Ramganga river, and on the plateau of Mysore between Shimoga and Tumkur. It is

* The fibre of *Chamserops humilis*, the European Fan Palm, is dried in the natural colour, or dyed black to resemble horse-hair, as a substitute for which it is used in upholstery (*Jackson, op. cit.*).

not uncommon in the Siwalik tract and outer Himalaya, attaining an altitude of 5,000 feet in Kumaon. It is also commonly cultivated and self-sown in most parts of India and Ceylon, except in Sind and the South-Western Punjab, where *P. dactylifera* takes its place.

Mr. P. Thompson reported that this is used in the Nagiri district for whitewashing and similar purposes, and that he has tried it for sweeping brushes. "It is," he says, "a fairly good stiff fibre, but when dry is somewhat brittle, which, of course, largely detracts from its value. It is possible that some different mode of treatment may improve it."

MUNJ.

(*Saccharum ciliare*.)

Habitat.—A tall handsome grass, 8 to 12 feet high, abundant over the greater part of North-West India, where, especially in the Panjáb, it covers large tracts of country. It is sometimes also planted in lines as a boundary hedge, more particularly in low-lying localities subject to periodical inundation.

In his recent Monograph* on fibrous manufactures in the Panjáb, Mr. W. H. Gee, District Judge of Dera Ghazi Khan, refers to brushes and moulds for metal wares made from MUNJ, weavers' brushes of MUNJ and KHAS, and brushes ("Juri") of bággar grass.

As regards MUNJ Mr. Gee writes as follows:—

"*Munj*.—Of the *Saccharum* family there are at least three species common in nearly every district, *vis.*, *Saccharum munja*, the true *munj*, the sheaths and spathe of which are especially valuable for rope making; the *Saccharum Sara*, known as sarkanda or kána, the largest reed of the three, used chiefly in chick and screen-making; the *Saccharum spontaneum*, kánh or káhi, used occasionally for ropes, but generally for chicks and thatching, the stem also forming the material for pens.

"The MUNJ and its varieties are undoubtedly the commonest and most useful of all our fibrous products. The rapidity of its reproduction, the strength of its fibres, and the ease with which it is collected and worked up all combine to render it indispensable to the zamindár. It is to be found on low damp ground near lakes and rivers, and a sandy soil is favourable to its growth. The only district in which it is actually cultivated is Jhelum, where 60 acres are annually planted with bulbs in the rainy season.

"The plant matures after two years, and then an annual supply of munj can be obtained from it. It shoots in the spring, and is cut in autumn. The bundles are then stacked until the slack season arrives, when the villagers extract the fibres by beating the sheaths with a wooden mallet, five sérs of munj being an average day's work. The thick ends of the sheaths are sometimes burnt first in order to render the separation of the fibres easier. Only the sheaths of the three upper joints of the stem are used for munj making, those below being too coarse for the purpose. In Mooltan the owner of the land generally employs labourers to cut the plant, he taking one quarter and they three quarters of the amount cut. If paid in cash they get 4 annas a day.

The different parts of the plant are known as follows:—

Sar or *sarkara*, the coarse leaves at the base, only used for thatching purposes.

Kána or *sarkanda*, the knotted stem when stripped of the munj.

* Lahore Civil and Military Gazette Press, 1891.

Munj, the sheaths and spathes of the stem.

Tik, the finer part of the stem without knots.

Sirka or *sirki*, the tapering flower stalk.

"From the *munj* is made the well-known *bán munj*, universally used for stringing charpoys and ropes of all kinds. . . . Brushes and moulds for metal wares are also made out of the fibre.

"The outturn of *munj* is 6,000 maunds in Gurgáon, ₹10,000 worth in Delhi, ₹8,750 worth in Hissár, ₹15,000 in Hoshiárpur, ₹10,000 in Lahore, ₹10,000 in Siálkot, ₹4,860 in Muzuffargarh. The average price is 20 sers a rupee, it being cheapest in Jullundur and Ferozepur, where the price is close on 30 sers per rupee."

At the Forest School, Dehra Dun, coarse dusting brushes are made from *munj* purchased locally in the bazar.

BROOMSTICK GRASS.

(*Aristida setacea*.)

Habitat.—Common in dry parts of the Panjáb and North West Provinces; also in South India, where it grows in dry, barren, binding soil.

In the Selections from the Records of the Madras Government (No. xxxiii, 1856, Reports on the fibres of Southern India) reference is made to teasing brushes from Kimedi made from the roots of a grass called *chfpuravalellu*. These are likely to command a ready sale if they could be brought prominently into notice.

The following information with reference to *vinapullalu*, *chfpurapullalu* and *pazaha usa vellu* was obtained by the recent enquiries of the Madras Revenue Board :—

From the Collector of Nellore District, Madras :—

The term "*Pazaha usa vellu*" is unknown in this district; but, on instituting enquiries how weaver's brushes are made, it is found that the roots of broomsticks ("*vinapullalu*" or "*chfpurapullalu*") are dug out of the ground by Yerukalas (wandering gangs) between October and March, and sold to weavers at rates varying from 12 to 4 annas a viss. These roots are available in all parts of the district.

From the Collector, Cuddapah District, Madras :—

The roots of *Pazaha usa vellu* can be obtained from forest tracts and waste lands in the taluks of Ráyachóti, Váyalpád and Kadiri of the sub-division, and Pullampet and Badvé taluks of the main division, but in quantities sufficient for sale and continuously. They are not even of such quality as to be useful for weaver's brushes. The weavers in this district purchase what they require from the Yerikalas (a wandering tribe), who bring the roots from the Nellore district and from Kalastri and Venkatagiri divisions.

Samples of *chfpurapullalu* roots and brushes made therefrom were sent to the Madras Board of Revenue by the Collector of Ganjam, who reported that they can be obtained from Parlakemidi extensively in rainy and cold seasons, but not in the hot weather, raw roots costing between 3 and 4 annas a viss. He further noted that the roots can be obtained in the Berhampore taluk also.

In a note on fibres for brush-making Mr. Brougham, District Forest Officer, Nellore, states that "*Vinapullalu* is in request among weavers,

who make brushes from the roots which, in sandy soils, attain at length of from 2 to 3 feet and, in hard soil, about 15 inches. The texture differs markedly according to soil. In loose sandy soil skirting the coast, the root fibre attains a greater length, and is less bristly. In laterite soil the fibre is coarse and stiff, but scarcely flexible enough for good brushes."

The weaver's brushes of the west coast are reported (*Indian Agriculturist*, December 12th, 1891) to be made of this grass, which, it is said, would be a very fair substitute for whisk.

CUSCUS, KHUS-KHUS OR KOOSA.

(*Andropogon muricatus*.)

Habitat.—A perennial, tufted grass, very common in every part of the coast (Coromandel, Mysore) and in Bengal and Burma, where it meets with a low moist, rich soil, especially on the banks of water-courses, etc. (*Roxb.*). It covers large tracts of waste lands in Cuttack. It inhabits the plains of the Panjáb and North-West Provinces, and ascends into Kumaon, 1,000 to 2,000 feet in altitude (*Duthie*). Cultivated in Rájputana and Chutia Nagpur (Gobindpur).

The roots (*khas*) of this grass are stated by Mr. W. H. Gee in his monograph on fibrous manufactures in the Panjáb to be used for the manufacture of weaver's brushes.

The grass is reported as growing locally in the Panjáb, but as being not found within 80 miles north of Multan. The price of *khas* is given as being Rs 5 per maund at Lahore, and Rs 6 to Rs 8 per maund at Dera Ismail Khan.

BHABAR GRASS.

(*Ischaemum angustifolium*.)

This species is described, in the *Dictionary of the Economic Products of India*, as being a perennial grass, plentiful in the Sub-Himálayan tract as well as in the hilly parts of Bundelkhand and Central India. It is frequently found associated with *Eriophorum comosum* (*Babar*), and hence proceeded an error, only recently corrected, of viewing both as one and the same. *Eriophorum* is a sedge and *Ischaemum* a grass, but both are no doubt employed for the same purposes.

In his monograph on fibrous manufactures in the Panjáb, Mr. W. H. Gee records brushes (*Furi*) as being made by the Bhanjras, a low caste of Hindus, at Nálagarh and Náhan, and quotes the price of the grass as being 12 seers a rupee at Simla, where brushes are sold in the bazar.

In the North-West Provinces this grass is used in the manufacture of small brooms for sweeping houses, etc., which are sold in all villages of the forests at the rate of four or five brooms to the anna.

PIONEER ARMY BRUSH FACTORY.

This Factory, in which bristles are mainly used, is now in full swing at Cawnpore. The manufactures comprise hair brushes, clothes brushes, horse brushes, blacking brushes, etc. The excellence of the material, cheapness, and superiority of the brushes in comparison with those previously supplied to Government by bazar brush-makers have been testified to, and it is to be hoped that the Factory will hold its own against imported European goods of a similar class.

BRUSHES SENT TO THE IMPERIAL INSTITUTE.

Fibre.	Place of manufacture.	Use.	Price.
Aloe *	Calcutta . .	Painting	R a. p. 0 8 0
	Ditto . .	Mill brush	0 6 0
	Ditto . .	Carpet brush	0 6 0
	Ditto . .	Horse brush	0 10 0
	Ditto . .	Clothes brush	0 6 0
	Ditto . .	Wheel brush	0 6 0
	Ditto . .	Carpet brush	0 10 0
	Cawnpore . .	Horse brush	0 9 0
	Ditto . .	Carpet brush	0 5 0
	Ditto . .	Ditto	0 6 0
	Ditto . .	Boot brush	0 6 0
Cocoa-nut (coir).	Bombay . .	Collecting flour from sides of hand mill	0 4 0
	Calcutta . .	Floor cleaning	0 7 0
Roots of <i>Cynodon dactylon</i> (Couch grass).	Poona . .	Sizing wool fair even (used for blankets)	2 0 0
	Ditto . .	Used in manufacture of cotton cloth	2 4 0 to
Horse-hair	Bombay . .	Painting	3 8 0
	Ditto . .	Ditto	0 1 0
	Calcutta . .	Shoe brush	0 5 0
	Ditto . .	Clothes brush	0 6 0
	Ditto . .	Ditto	0 4 0
	Ditto . .	Cleaning cloth on loom	0 6 0
	Ditto . .	Carpet brush	0 7 0
	Cawnpore . .	Clothes brush	0 6 0
	Ditto . .	Boot brush	0 3 0
	Ditto . .	Ditto	0 4 0
	Ditto . .	Horse brush	0 6 0
Horse-hair and Aloe.	Ditto . .	Boot brush	0 6 0
	Calcutta . .	Clothes brush	0 5 0
Pig bristle	Cawnpore . .	Ditto	0 6 0
	Ditto . .	Cleaning brass buckles, etc. . . .	0 6 0
Aloe *	Calcutta . .	Wall brush	1 0 0
	Bombay . .	Cleaning gold and silver ornaments	0 4 0
Aloe *	Calcutta . .	Scrubbing brush	0 13 0
	Ditto . .	White-washing brush	0 10 0
	Ditto . .	Chimney brush	0 4 0
	Ditto . .	Nail brush	0 4 0
Aloe and horse hair.	Ditto . .	White-washing brush	0 8 0
<i>Andropogon</i> , sp.	Ditto . .	Cloth brush	1 4 0
<i>Caryota urens</i> (Kittul).	Ditto . .	Horse brush made from fibre steeped in mustard oil and unsteeped	0 12 0 and 0 10 0

Fibre.	Place of manufacture.	Use	Price.
			Rs. a. p.
Cocoanut . .	Calcutta . .	Scrubbing brush . .	0 13 6
	Ditto . .	Deck brush, large . .	0 3 0
	Ditto . .	Ditto small . .	0 1 0
	Ditto . .	Furniture brush . .	0 4 0
Horse hair . .	Ditto . .	Stove brush . .	0 14 0
	Ditto . .	Indigo brush . .	0 6 0
	Ditto . .	Shoe brush . .	0 8 0
Jute	Ditto . .	White-washing brush . .	0 8 0
Palmyra . . .	Ditto . .	Broom	1 8 0
Pig bristle and horse-hair.	Ditto . .	Hair brush	1 0 0
	Ditto . .	Ditto	0 13 6
Saccharum ciliare (Munj)	Dehra Dun . .	Dusting brush . .	
Ischoemum angustifolium (Bharbar grass)	Ditto . .	Ditto	
Andropogon muricatus (Khas).	Panjáb . .	Weaver's brush . .	2 0 0
Kittul (undressed, Lettering in coir).	Coonoor Brush Factory . .	Horse brush	0 14 0
Kittul (oil dressed).	Ditto . .	Ditto	0 14 0
Kittul (undressed, Polished back).	Ditto . .	Ditto	1 4 0
Kittul (edged with horse-hair).	Ditto . .	Clothes brush	0 12 0
Kittul	Ditto . .	Hair brush	0 8 0
Ditto	Ditto . .	Scrubbing brush . .	1 2 0
Kittul and bristle	Ditto . .	Ditto	0 14 0
Bristle	Ditto . .	Horse brush	1 4 0
Cocoanut (coir) .	Madras . .	Grooming cattle . .	0 1 6
Ditto	Ditto . .	White-washing . .	0 8 0
Cocoanut (spadix) .	Ditto . .	Ditto . . . .	...
Aerial roots of Pandanus odoratissimus (Screw Pine).	Ditto . .	Ditto	0 0 2
Ditto	Chingleput District, Madras . .		
Roots of Aristida setacea (broom-stick).	Madras . .	Weaver's brush . .	4 8 0
Ditto	Ditto . .	Ditto	0 2 0

EDGAR THURSTON,

Offg. Reporter on Economic Products
to the Government of India.

II.—CORRESPONDENCE.

Manchuria Tiger Skins.

SIR,

The Tiger Skins with long hair referred in "E. D.'s" letter in the last *Forester*,* came no doubt from Manchuria, or, as the shopman seems to have suggested, North China.

Captain St. John Richardson, in a miscellaneous note, which appeared in No. 2., Vol. VI, of *The Bombay Natural History Society's Journal*, mentions that he saw one of these tiger-skins from Manchuria, in Rowland Ward's shop, and that "it measured '13 feet 4 inches, and had deep fur more like the snow-leopard 'then any other animal I know.'" Messrs Rowland Ward also informed him that they had recently *purchased* one of these skins for £63.

HUNTINGDON.

*NOTE.—February No.

HON. ED.

The Departmental Blazer.

SIR,

A proposed pattern for a Blazer is in course of circulation among Bombay Foresters for the expression of their opinion. If it meets with sufficient approval here, it will be passed on to Dehra, and if necessary, to other provinces, for further criticism. Undersigned could not make anything satisfactory out of paper and paint-box, and the samples of cloth procured were only enough for one small pattern. Sketch of pattern is enclosed, with a bit of cloth of the ground color. The two small strips are only approximations to those actually chosen.

VELLEDA.

The pattern sent is that of wavy tree-like lines of dark green on a lighter ground. We confess that we do not much like it. We have also received from Burma specimen of a pattern which has apparently been adopted there, of two broad alternate stripes of light and dark green. This pattern is good and we prefer it to the other.

HON. ED.

Potato Cultivation.

TO THE EDITOR OF THE FORESTER,

SIR

Anent your review of the Saharanpore Horticultural Gardens, regarding Potato experiments, it may interest you to know that much more extended experiments than those of Saharanpore, have been carried out at the Ramghur Tea and Fruit Gardens, and the Government Nursery, Moteswar. The Ramghur trials were made with forty-four varieties, and the Government Nursery trials with ten varieties, thus fifty-four kinds were experimented with, moreover the trials extended over three seasons, and on that account are of great value in forming a definite opinion. The potatoes were bought in 1890 for the most part, and no expense or trouble was spared to get together a really representative collection embracing good samples of all seasons and shapes. The collection came from four well-known seed firms in England, two of which are expert hybridizers and seedling raisers, and as a matter of fact contained the bulk of the varieties sent by Messrs. Sutton & Sons to Saharanpore. The experiments came under my immediate supervision. The elevations of Moteswar and Ramghur range from six to eight thousand feet, and the trials were made in good virgin jungle soil. As in the Saharanpore trials, very variable results were obtained, interesting enough to the expert, but of little interest to the general reader, suffice it to say many of the kinds were apparently a failure, others were a partial success; several were promising, and one only a magnificent success, but this was put down to the fact that the tubers were all newly imported, and it was fairly argued no doubt that the second season would give different results. Unfortunately the firm from whom the Moteswar potatoes were obtained delayed despatching a month beyond the stipulated time on the ground that the weather was very bad at home. English firms do not sufficiently understand that a month behind hand at Bombay is a far more serious matter than a little bad weather in England. I mention this because the potatoes suffered very severely, however all were again tried the second season, the results were again very variable and I am bound to add vexing, as the promising varieties of the first year were amongst the worst failures, but the result of the second trial was that twenty-four kinds were promptly condemned as not worth further trial. Coming to the third season, the balance of twenty kinds were again tried, and reduced to eight. Regarding the ten varieties at Moteswar, two only are worthy the name of a success, and those two unequally so. One is the well-known White Elephant and the other a so-called Australian Red Giant, I say so-called, because I imported the same kind under quite a different name. The up-shot of three years costly and disappointing experiments is that I have given up importing English potatoes, mainly on the ground that from a commercial point of view the game is ruinous, and by no means pays,

paying apart there are several well defined conclusions I have arrived at regarding the importation of potatoes. Firstly, indiscriminate importation is wholly wrong, and the Saharanpore trial is strong confirmatory evidence of this. Secondly, strictly limited importation is to be recommended, I mean the limitation more especially for varieties as distinguished from quantity—why, for instance, is “Windsor Castle” by far the best of those tried at Saharanpore? My answer is that this kind is a head and shoulders above a small army of other and older varieties. A still more striking example is to be found in the variety known as *Magnum Bonum*: when this kind was brought out by the very enterprising Messrs. Sutton & Sons, some fifteen years ago, it was the very Emperor of potatoes, and nothing in those days was anything like equal to it, alas to say it is down amongst the sickly diseased herd, a wreck in the old country. It is not too much to say that fully ninety-five per cent of all the potatoes grown in Kumaon and many other places in India are of this variety, and there are not wanting ample signs that this once splendid kind is coming to grief and nearly spent out. Now this is a very serious matter, because it means for Kumaon that with its failure will inevitably come the collapse of potato cultivation for the time being or until Government comes to the aid of the native cultivators with a new kind. Doubtless you are aware that the real potato disease has appeared in the Poona district, and that the study of the disease will no doubt be interesting. But it will not save a dying man, and the Doctors will find very heroic remedies necessary to prevent total collapse: and those who have to study this disease will do well to remember it is the leprosy of potato diseases, and nearly useless to waste money and time upon it. The true remedy is the English one, and I would beg leave to earnestly commend this to the attention of Government, for if we take England on its merits it is undoubtedly the best potato producing country in the world. Those who know French, German, Dutch, and American potatoes will, I am sure, bear me out in this, yet on the whole England is climatically one of the worst countries to be found for the potato, nearly every natural condition is against it, perhaps the best thing that can be said about it is, that it is temperate, of course cultivation is thorough, and the soil is good, and the best implements of culture are used, but these are more or less within the reach of all and do not count for England, any more than for any other place; the one natural advantage being a temperate climate, and I doubt of this being a very great advantage, an average of ten degrees more heat would be far better. Then why does the country produce the best potatoes, and hold its own against enormous odds and constantly recurring disease in its worst form? My explanation is, and I think it is the true and only one, that there is in England a body of systematic and zealous hybridisers and seedling raisers, and consequently new blood is ever flowing in, and ousting the weak sickly varieties. In short, evolution is in

very full force, and the weak go ruthlessly to the wall. Leaving out of account eminent Firms like Sutton & Sons, Carter & Co., Veitch & Sons, the Brothers A. & R. Dean, Fidler & Co., &c., a large number of the professional gardeners of the Country try their hand at raising a new potato and many succeed, and thus there is a constant string of new kinds, with all the vigour of new life in them: this is what I would try for India's deteriorating stock of potatoes. I believe I am open to be told this has been tried and failed; if so, why did it fail, and again where were the experiments tried; if on the plains, failure might well be written very large at the outset of any experiments with potatoes. But I see no reason why potatoes at an elevation of 5,000 feet and upwards should not seed freely and allow of hybridizing and thus the raising of new and vigorous kinds. It might be fairly argued that kinds so raised, would be likely to last longer than those raised at home as the conditions are more favourable. Finally, hybridising must be understood and carried out properly or the results are worse than useless. I doubt, too, if isolated efforts will or would lead to much, but a properly organized Government farm where the thing could be carried out properly under good supervision should not only be of the greatest benefit to the country but pay its way in time.

F. W. SEERS,

Manager of the Ramghur Tea and Fruit Gardens, and Superintendent of the the Government Nursery, Kumaon, Moteswar.

III.—OFFICIAL PAPERS & INTELLIGENCE.

The Palmyra Palm.

The Inspector-General of Forests has recently sent the following Circular letter round to Conservators.

"I would feel much obliged if, in consultation with your Divisional Officers, you would furnish me with authentic information regarding the occurrence of the Palmyra Palm (*Borassus flabelliformis*) in your Circle; and whether it is plentiful, common, or rare. It is stated that in some districts the fibre produced by this plant at the junction of its leaves is less developed than in others, while in some localities it is entirely wanting. This, I beg, may be specially noticed and recorded."

Report on the effects of the late frosts on vegetation in Hongkong.

The unprecedented cold weather which the region about Hongkong was recently subjected to, calls for some notice to be taken of it, therefore I have the honour to submit a brief report which it may be considered useful to put on record. Records of experiences of meteorological phenomena such as we have just had, besides being of passing interest are so frequently of use in practical dealings with various subjects, that for this reason opportunities to record unusual phenomena should not be neglected. It does not, however, come within the province of this department to go much further into the meteorological aspects of the subject than is demanded in connection with its injurious effects on vegetation.

After a period of ordinary Hongkong dry, cool weather, rain fell on the 13th January and continued daily up to the 16th instant. In the Gardens, at 300 feet above sea level, the following quantities of rain were registered with a Glaisher's rain gauge :—

January 14,.....	·14
„ 15,.....	·35
„ 16,.....	·46
„ 17,.....	·45

On the 15th instant the temperature fell in the afternoon to 39° Fahrenheit, thermometer at 350 feet above sea level. On the 16th, at 9 A.M., it stood at 35°. On the 17th the thermometer stood at 31° at 9 A.M., which was the lowest temperature observed at the Gardens. During this period the sky was overcast except for a short time about noon on the 17th, but on the morning of the 18th it was clear and the sun shone brightly throughout the day, the temperature having risen to 43° at 4 P.M.

Unfortunately there are no official records of temperature at Victoria Peak, 1,818 feet above sea level, but, by such information as could be obtained from private observers in the hill district and observations made here, it seems that the temperature must have fallen at the summit to about 25° or 24° F.

On the river at Canton, and *en route* between this port and that place, low temperatures were recorded in the reports of the steam-ships *Powan* and *Honam*. They give—

January 16th at 1 A.M. 23° about 28 miles below Canton.

„ at 10 A.M. 26° about 85 miles from Hongkong.

„ „ at 1 P.M. 25° at Canton.

„ „ 18th at 10 A.M. 28° about 25 miles from Hongkong.

On the peninsula of Kowloon the cold appears to have been greater than in Hongkong, ice was seen on pools of water in the roads within 50 feet of sea level, and at the Kowloon Docks ice was observed at the bottom, 30 feet below sea level, of an empty dock.

Since the Observatory records began in 1884 the temperature has not fallen, until now, at the Observatory, below 40° F. I remember on one occasion, I think about 17 years ago, ice was found at Victoria Peak, but there is no record within my experience, which extends back nearly 22 years, when ice was observed below 1,700 feet altitude.

The continued low temperature combined with fall of rain from an apparently warmer stratum of air above resulted in the formation of ice varying in quantity from a thin coating on the upper leaves of pine trees growing at 300 feet above sea level to a thick encasement of perfectly transparent solid ice of 5½ inches in circumference on the blades and bents of grass at the summit of Victoria Peak. The grass bents themselves, which were the foundation on which the ice accumulated, were not more than an eighth of an inch in diameter, yet the formation of ice was so gradual that with the enormous accumulation of ice which became its own support, the bents retained their natural upright, or but slightly pendent position. These large accumulations of ice were on the windward side of the hill where rain drifted, but even on the lea side the average coating of ice was about 3 inches in circumference.

Evergreen shrubs and trees carried on their leaves solid coverings of ice ¾ of an inch in thickness. The great weight of this ice caused the branches of trees to assume a pendent form, the strain in many cases causing the limbs to snap off with a crash. All vegetation throughout the hill regions of the Colony was thus covered with ice, as were also most other objects. Telegraph and telephone wires from Victoria Gap upwards were covered with ice ¾ of an inch in thickness, and, in addition, carried icicles as much as 3 inches in length as close as they could be packed side by side. This caused many of the telephone wires to break, and the iron post at Victoria Gap which supported them was snapped off a few inches above the ground.

The windward sides of the walls of the look-out house at the Peak were from top to bottom covered with perfectly transparent ice ¾ of an inch in thickness.

All the hills on the mainland and Lantau Island were likewise white with ice, one of the hills (3,147 feet) of Lantau having what appeared to be snow for some few hundreds of feet down from its summit. As early as the evening of the 15th January, the summit of Taimoshan (about 3,300 feet) on the mainland had assumed a whitish appearance, presumably from ice or snow.

The effect of the extremely low temperature on vegetation has been disastrous. The damages in the Gardens consist chiefly in the injury or destruction of leaves, but some plants are quite killed, these being natives of much warmer regions than Hongkong. Many of the decorative plants which were not killed will be months before they can regain their ornamental appearance.

Every possible precaution was adopted to minimise the effect of the cold. The plant-houses, which are provided with screens merely to produce shade, were all matted in and the roofs covered with straw. In spite of these precautions, however, many plants suffered very severely.

In the orchid-house, which was covered with mats and straw, all our best orchids have suffered very greatly, many being entirely killed while others were so much injured that, even if they survive, it may be some years before they regain their previous luxuriant state. A healthy plant, received from Calcutta several years ago, of *Dendrobium aggregatum*, is apparently killed, while plants of the same species growing by its side, and also others on trees where they had no shelter, which I collected 10 years ago on the Lo-fan mountains, about 60 miles from Canton, have escaped unharmed. This seems to show the capability of the plant in adapting itself to colder regions than it is generally found in. In ordinary winters the temperature is too low for many kinds of orchids and other tender plants.

The highest point of the Gardens is 320 feet above sea level, the lowest part 175 feet. Some plants of the same kinds which were damaged at the upper portions were uninjured at the lower parts of the gardens.

Of exotic trees planted on the hills *Albizzia Lebbek*, *Aleurites triloba* (candle-nut-tree) and *Eugenia Jambos* (the rose-apple-tree) had all their leaves killed at and upwards of 600 feet above sea level. Trees of the rose-apple at about 800 feet altitude have been entirely killed.

At 600 feet altitude indigenous plants began to be affected, the injuries increasing with higher altitude until at about 900 feet when the extreme limit of low temperature which some plants could bear was reached, and death ensued. Most of these are tropical plants of which Hongkong, Formosa, the Luchu Islands in the Far East, and the Sikkim Himalaya in India are the northern limits of the geographical area from which they have been recorded. Of the plants killed or injured, *Ficus Harlandi*, Benth., *Gordonia anomala*, Spreng., and *Garcinia oblongifolia*, Champ. are known only from Hongkong. Although many of our indigenous plants have not been yet discovered elsewhere, it is to be expected that when China is better known they will be found over a larger area than the restricted one of this island. The fact of the above named plants having succumbed to the late frost indicates that when they are discovered elsewhere they will be found southward of Hongkong.

Considerable damage to vegetation seems to have been caused about Canton where the alluvial lands are highly cultivated. The Reverend Dr. B. C. HENRY, in a letter dated 26th January, informs me that "The destruction of vegetation about Canton has been very great. The banana plantations "are ruined, and

the bamboos have suffered. The *Aleurites triloba* look all shrivelled up, while "*Begonias*, *Euphorbias*, *Crotons* and scores of others are simply destroyed." What Dr. HENRY reports indicates severer weather at Canton than here, as is proved by the reports of the steamers above referred to. *Aleurites triloba* leaves being shrivelled up at Canton, while they are here at 300 feet altitude uninjured, but at 600 feet here they are affected, and completely destroyed a little higher up the hill.

IV.—REVIEWS.

Annual Progress Report of State Forest Administration in New South Wales, for 1891.

Last October we noticed the Report for 1890, and now we have received that for the succeeding year. During 1891, various important steps were taken in the direction of re-organizing the department; two Inspecting Foresters were appointed who divide the colony between them, and the relieving Forester, alluded to in our last review, has also been appointed: the revenue is now received direct at the head Forest Office instead of at the Colonial Secretary's Office, the office staff has been strengthened, and some changes were made among the Foresters.

The area of Forest Reserves (1,013 in number) has apparently increased since the last report, being now 5,600,653 acres, or 7,815 square miles; the revenue was £18,455 and the expenditure, £23,875, shewing a deficit of £5,420, or rather more than last year. Both revenue and expenditure have increased each about £300, the latter being chiefly due to "the conservation of the red cedar upon the Northern Reserves, the thinning of the wattle at Otford and West Bargo, and the thinning and pruning of the valuable 'red gum saplings' on the river Murray." It is expected that the returns in a few years will amply justify the outlay.

The following statement shews the result of forestry operations during the year:—

"The result of operations (the cost of which is included in a 'previous statement,) during the season on different reserves and 'plantations is very satisfactory. The total number of trees which 'have succeeded and are now making fair progress from the different systems adopted in thinning and planting, are as stated 'below.

' From planting	...	...	Rs.	16,450
' " distribution to School and public bodies			"	75,000
' " thinning on the Murray (red-gum)		...	"	2,000,000
' " " on Don Dorigo (red cedar)		...	"	7,000
' " " at Otford and West Bargo				
	(Wattles)	...	"	128,000

- Total number of trees growing in plantations
 ' and on forest areas which have been oper-
 ' ated upon during the year under review, 2,226,450
- Roughly speaking, the expense in connection with these oper-
 ' ations has not exceeded three-eighths of a penny per tree.
- The botanical work of the department is noticed at some
 ' length, no less than eleven pages of the Report being devoted
 ' to specimens collected by various people, and seeds and timbers
 ' sent away. This detailed list would be more in place in an
 ' Appendix.

A notable feature in the Colony is Arbor Day, the account of which is as follows :—

" In 1890 an Arbor Day in connection with the Public Schools of the Colony was instituted by Mr. J. H. Carruthers, late Minister of Public Institution, and he decided that for the year 1891, the 21st of August be celebrated as a public holiday by the Schools for Arbor Day.

' At most of the Public Schools, Arbor Day was regarded as a holiday either on the particular day appointed or at a later date as circumstances permitted.

' Most of the trees supplied to the Schools were obtained from the Gosford State Nursery.

' Every endeavour was made by the Forest Department to execute the many orders which were received for trees and shrubs, and I think Arbor Day proved to be a pleasing and successful educational scheme. It brought parents, scholars and teachers together under agreeable circumstances, and opened up to youthful minds a fresh and almost unknown page in the natural history of the Colony.

' Some 4,000 catalogues of the trees for distribution, and also of the lecture upon Arboriculture, and the botanical drawings issued by the Forest Department were distributed by the Department of Public Instruction to the various Schools in the Colony. In many cases also both the lecture and the catalogues were distributed to the various corporate bodies in the Colony, to whom also trees at the Gosford Nursery were available.

' It is estimated that during the year something like 1,000,000 trees and shrubs were given away by the Forest Department to Schools and corporate bodies in connection with Arbor Day and as exchanges for trees, plants, and seeds received.

' Last year there was some comment upon the smallness of some of the plants issued to schools and in a few cases there appeared to be a prejudice against small and young plants in favor of those of larger growth. No doubt in the first instance largely developed plants look much nicer, but they are not always so successful in maturing."

The number of plants of all sorts in the Gosford State Nursery is 1,225,709, a considerable increase since the previous year, the trees most numerous represented being *Eucalyptus corynocalyx*

and the sugar gum, and *Pinus insignis*, these two with *Ligustrum pubescens* forming numerically one half the total number of plants in the nursery, in which there are over 220 species altogether.

Section VIII of the report deals with the planting and thinning operations of the year. First we have red cedar which was planted out both from nurseries, and from the forest, where it was growing too thickly together and the result is reported as most successful. Then we have some interesting paragraphs about the struggle between the mining population of Broken Hill, and the pastoral and homestead lessees who complain that the edible shrubs they depend on for feeding sheep are cut down for fuel by the miners. Broken Hill is one of the richest silver mines in the world where the lead ore which is found with the silver alone pays all expenses thus leaving the whole of the silver as profit. MR. EDNIE BROWN writes :—

“ Broken Hill Mining Companies are a good deal interested in the source of wood fuel, and any drastic attempt to debar wood-getters from obtaining such timber as there is in the district would cause considerable inconvenience to some of the mines. At the same time there is the fact that wood for fuel for all purposes can be imported by rail into Broken Hill.

“ On the other hand, the Department of Lands is largely interested in the preservation of Mulga, and all other edible trees in the district, as it is the mainstay of the pastoralists ; and in that droughty country, so frequently void of grass, the growth of the edible shrubs upon pastoral holdings is of grave consequence, and therefore any depletion of such trees and shrubs must depreciate the value of station properties.

“ This very serious matter is receiving consideration at the hands of the department.”

The thinning operations in the extensive forests of red gum on the Murray river are thus described :—

“ The forest contains a very large number of self-grown seedlings and saplings, and it has been found necessary owing to their thickness on the ground, with a view to the permanency of marketable timber, that they should be properly attended to in the way of thinning and pruning.

“ A start in this direction was made in April 1891, the work being continued till the end of the following June, when it had to be given up for a time owing to the land being inundated.

“ The operations, so far, have been conducted along the banks of the river in the counties of Cadell and Wakool.

“ Some sixty men were employed upon the work, and the result was that some 3,500 acres of forest land were operated upon.

“ The works were again commenced in November of last year and up to the date of this Report some 2,000 acres more or less, have been similarly operated upon.

'The work is still in progress, and about thirty men are employed in connection with it.

'The young trees are in all stages of growth, ranging in height from 2 feet and 3 feet to over 50 feet and 60 feet; and in all cases they are of a straight growth, almost branchless except at the top, healthy, and show every sign of eventually producing timber of a knotless and superior quality.

'Roughly stated, I may remark that the thinning operations have so far extended for about 12 miles of frontage along the Murray River.

'It is estimated that, taken as a whole, there have been 5,500 acres operated upon in the manner described, and something like 350 healthy young trees have been left to the acre, thus showing that up to date about 2,000,000 of young trees have been treated and will remain as a standing crop to serve as a future timber supply."

We shall be interested in hearing the result of this thinning, in due course; it is estimated that in five to ten years time, there will be a large number of excellent piles available which are worth 15s. to 35s. each at the present day. The red gum is *Eucalyptus rostrata*, and this is what Mr. EDNIE BROWN writes about it:—

"It appears that the timber of the red gum (*Eucalyptus rostrata*) is held in very high repute in the Colony of Victoria, and is therefore preferred to any other class of timber in the construction of piers, wharves and bridges, and also for railway sleepers.

'In Melbourne, Sandridge, and Williamstown he (Mr. MANTON) reports having examined piles of red gum which had been over twenty-seven years in the ground and still perfectly sound. In a wharf at Echuca, constructed of red-gum timber twenty-five years ago, the girders and planking are yet quite sound. The same may be said of a wharf at Moama erected sixteen years ago.

'In the early days of the opening up of the Murray, boats of various kinds were constructed of red-gum from the Murray and adjoining forests, and many of these, although over twenty-five years old, are still in good condition.

'The department is in possession of a red-gum street paving block, obtained through the courtesy of Mr. MOUNTAIN, City Surveyor, Melbourne, which was taken out of the Flinders Street roadway near King street, Melbourne, after being there nearly eleven years—the street, after being laid with wood blocks, having been opened for traffic on the 9th April, 1881.

'Although this block was situated in a part subject to the heaviest traffic, the wear has only been about three quarters of an inch, and the wood of the block is perfectly sound.

'The block was taken up midway between the curbing and the tram rail, consequently it represents a fair average wear upon the roadway at that particular place."

It is evident that the Director-General is going the right way to work in endeavouring to conserve and improve these valuable forests which extend over 460,000 acres.

The last paragraphs of this section are devoted to Wattle conservation, in which the importance of the true wattle for tanning purposes is dwelt upon, the present arrangements for stripping the bark discussed, and the effects of thinning the natural wattle reserves, with proposals for future planting given.

In connection with the introduction of exotic trees, to produce timber of a lighter nature than the indigenous species—noticed in our last review, Mr. EDNIE BROWN states that he has about 243,000 plants available in the Gosford Nursery, and the specimens of American ash grown in South Australia have proved serviceable for staves of buggy wheels. As a beginning, he proposes to plant out small areas with pine, cypress, ash, oak or elm, as the circumstances of each district admit.

The Report closes with some interesting statistics regarding forest areas in various parts of the world, and of the timber trade in New South Wales. The usual list of Forest Reserves is given in the Appendix.

A. S.

Report on Canal Plantations, N.-W. P. for the year ending 31st. March, 1891.

This Report was not written till July, 1892, but the reason of this delay is nowhere explained. These plantations resemble in some points a small Forest Division, or large Range, with an area of 36,000 acres, and a net revenue of Rs. 86,000. The revenue was lower than that of the preceding year, owing to the completion of the Nadrai aqueduct, and other causes, while the expenditure was some Rs. 10,000 higher, owing to increased charges for sowing and planting and clearing jungle on canal banks capable of harbouring pigs.

The number of trees counted at the close of the year was 1,780,053, while 140,608 had been felled, the increase in the number counted being 8,790, so that felling did not diminish the stock of the total about 45,000 are over six feet on girth.

An interesting experiment is being carried on on the Upper Ganges Canal, where 4,000 seedlings of red gum (*Eucalyptus rostrata*) were planted out near Jawalapur, in order to see whether this tree will yield poles for the extensive head works above Hurdwar. For the temporary bunds alone they require 13,000 poles of various sizes every year, and it is believed that in ten years the red gum will yield sufficiently large poles for this purpose. From what we have seen in the Saharanpore Botanical Gardens there is no doubt that this will be the case. The difficulty is that the

canal authorities would have to plant, say, 15,000 seedlings every year, and then the carriage up stream for 10 to 17 miles, or even more, will prove expensive. At present, their supply of these poles is derived entirely from the forests of Dehra Dun—private or Government—and a special coppice area has been set aside in the Government forests near the Ganges, and is being treated as such, in order to yield in the future a regular supply of the smaller poles at any rate which are the most numerous. It will be interesting to observe whether the red gum on the Ganges Canal will furnish the same quality of timber as it does in New South Wales. If so, they have certainly planted the right stuff. For the temporary bunds, it does not much matter, as they are washed away every year, but for permanent spurs, the timber they put in should be durable.

“The Superintending Engineer reports that the experimental plantations of *Eucalyptus* (chiefly *rostrata* and *robusta*) in the Northern Division have been eminently successful so far. Of the *rostrata* sown in October 1888, 130 trees came into the 3rd. class in the enumeration of March 1891. In the course of another year some idea may be formed as to whether these *Eucalypti* will furnish poles suitable for the Bhimgoda crib works. If they do, planting on a large scale will be undertaken.

It would be as well for the Canal authorities to calculate the area necessary to produce the quantity of poles required every year; it would probably take at least 12 miles of Canal bank.

On the Agra Canal, grazing and lopping are stumbling blocks, as the following remarks shew :—

“The Superintending Engineer draws attention to the very great difficulty of maintaining any kind of fence at a reasonable cost, and points out that though a thorn fence made of Kikar thinnings, as suggested by the Inspecting Forest Officer, may be suitable for Forest tracts, yet without a large establishment to watch and patrol it, as compared with the area to be guarded in the long narrow strip of canal plantation, it would be impossible to prevent the fence itself from being carried away rapidly for fuel in the adjoining villages.

“The Superintending Engineer further points out that apart from the damage done by cattle grazing on young plantations, there is another cause of very serious damage to the young trees with which the Canal plantation establishment that can be employed is quite unable to cope, viz, the wholesale lopping that goes on in order to obtain young shoots as food for goats and cattle. This is a well-known evil on this Canal. The Superintending Engineer suggests that the district authorities might be induced to help in this matter.”

The net revenue of the canal plantations is a mere drop in the ocean compared to what they receive from irrigation, and a very large part of it might be devoted to making a permanent wire fence: wire netting for choice with iron standards; such a fence when once set up would be indestructable and absolutely efficient and it

would be a sound policy to devote Rs. 50,000 a year out of the net revenue, which can well afford it, until the whole system of canals is fenced from beginning to end. According to the figures in the Report, there are about 2,400 miles of boundary but much of this is said to be already fenced, though doubtless not in a permanent manner. Supposing it were necessary to fence half of this, it could probably all be done in 10 years.

A. S.

Report of the Agricultural Department, Burma, for 1891-92.

This big Report, lately received, contains nothing much likely to be of special interest to Forest Officers, though it is remarkable as an evidence that good solid work is being done in the matter of revenue survey and assessment. The Report is illustrated by a series of district maps which we have found very interesting.

V.—SHIKAR.

The People's Tiger.

In the People's Park at Madras has lately been incarcerated a tiger which was captured in the forests of Tinnevely by Mr. C. Dupré Thornton. The method employed was a cage made of palmyra rafters and iron bars, with a trap door, and a separate chamber which contained the bait—a goat. The following extract from the *Madras Times* will be interesting :—"Yesterday I paid ' him a visit. He knew his old master at once and rushed at the ' bars in a most affectionate way which I was accustomed to ; but ' the bystanders, who didn't know his tricks, fled in alarm. He ' is as savage and surly as ever. In the day he disdains to eat any ' meat, but at night he is forced to eat. His rations are 25 lbs. ' of meat a day, or about a goat and a half. The old keeper relates ' that he was very savage when first let in. He jumped with one ' bound to a window, near the ceiling, but the bars stood firm, and ' stripes was sold. For two or three days he bounded backwards and ' forwards in his new home, refusing to eat anything, and flying ' at the bars when anyone came near. It will require years of ' imprisonment to tame his proud spirit. He wants a mate very ' badly, as the tigress in the Zoo is old enough to be his grand- ' mother. Perhaps some of your readers may be able to catch a ' tigress in the same way as I caught the tiger, and send her up to ' Madras."

Sport in Austro-Hungary.

The January number of the *Revue des Eaux et Forêts* after discussing the merits of smokeless powder for sporting purposes enumerates the bags made by various sportsmen during the past year in different parts of Austria. Without giving the details of these bags, many of which are enormous, we may quote the following which may interest some of our shikari readers. It is the official list of the game killed in Cis-Leithania only (and exclusive of Dalmatia) during the year 1890, 11,470 red-deer; 2,764 fallow deer; 65,303 roe buck; 7,038 chamois; 2,640 boars; 1,395,838 hares; 83,687 rabbits; 526 marmots; 4,950 capercaillie; 21,635 grouse; 1,960 ptarmigan; 3,524 rock partridges; 152,796 pheasants; 1,105,579 partridges; 91,167 quail; 42,450 woodcock; 1,939 wild geese; 49,590 wild duck; 39 bears; 136 wolves; 32 lynxes; 26,163 foxes; 9,712 martins; 25,877 weasels; 1,150 otters; 4,199 badgers; 432 eagles; 120,703 hawks and falcons; 36,818 owls.

VI.—EXTRACTS, NOTES AND QUERIES.

Roadside Arboriculture in Bengal.

Mr. C. F. Worsley, Magistrate of Monghyr, has drawn up the following report regarding the system of planting trees followed by him, when he was in charge of the district of Mozufferpore, and the Government has directed that it be circulated to all district officers and district boards :—

“When I first commenced the system of planting trees along the sides of roads in Mozufferpore district in the year 1877, I adopted the plan which, I believe, is usually followed by inexperienced amateur planters, of working through contractors, and allowing them to plant very young trees or to raise them from seed in the spots where the trees were intended to grow up. Each of these young trees or seedlings required to be protected by a gabion or bamboo fence, and it was soon discovered that the expenses of repairing or renewing the fences and of supplying water to the young trees in the hot season were more than the District Road Fund could conveniently bear. I accordingly tried the experiment of raising young trees in nurseries from seed sown either in pots or in the open ground, and of planting them out along the sides of roads when five or six feet high. It having been found in practice that the young trees so raised in pots succeeded best, this system was generally adopted in Mozufferpore from the year 1880.

In my report No. 99, dated 6th February, 1880, for the Road Cess year 1878-79 (published in pages 1471-1479 of Part II of the *Calcutta Gazette*, dated 29th September, 1880), I described at some length the operations of the Mozufferpore Road Committee in connection with the planting, and the subjoined extracts will explain the advantages of their system :—

“On all other roads the trees are fenced with strong bamboo gabions, six feet in height and two feet six inches in diameter, made on one uniform plan, and built round the tree when planted in the following manner :—

“Five whole, not split, bamboo posts eight feet in length and not less than one-and-a-half inches in diameter, are sunk in the ground to a depth of two feet at equal distances from each other, and a radius of 15 inches from the stem of the tree. Four pieces of split bamboo are then placed between the posts, and split bamboos are woven in basket fashion to a height of six feet, the last six inches being passed through loops in the bamboo posts to prevent travellers removing and untwisting the basket-work, which was a common and very mischievous practice, and one that caused continual labour and considerable expense in repairs. I may add that the system now adopted has been absolutely successful in preventing such mischief and injury ; as, although easy to twist the split bamboos through the loops when green, it is most difficult to remove them when they have become dried and set.

Nursery Gardens.—Two nursery gardens have been established during the last Road Cess year 1878-79—one at the dak bungalow in Mozufferpore, the other in the District Engineer's grounds. The formation of nursery gardens was rendered necessary for several reasons, amongst them the following :—

“(1). The difficulty experienced in obtaining young fruit trees of even inferior description.

“(2). The policy of planting none but good varieties and descriptions of fruit trees, so as to ensure eventually from the sale of the fruit a handsome return for the outlay and expenditure incurred in planting and maintaining them.

“(3). To prevent injury in transplanting trees with tap roots such as *Artocarpus integrifolia*, *Bassia latifolia*, and *Dalbergia Sissoo* by raising them in pots, it having been found by practical experience most difficult to transplant such trees satisfactorily. Experience has impressed the necessity of using pots for all future nursery operations as being eventually a safer and more economical way of raising and transplanting young trees than in and from the open ground. After much care, time, and expense have been laid out and incurred on the young trees in the nurseries, it is very disappointing to find them dying a few days after being transplanted, in consequence of injury to tap roots, and here I would observe that it is very inadvisable to plant out any trees less than two years old. The cost of tending, watering, and maintaining them is much less in the nurseries than when they are scattered over many miles

of roads, and as the existence of a bamboo fence such as is used in this district is three to four years by the time it is worn out, its need is no longer required, the trees being five to six years old, and strong enough to do without such protection. We have now in the nurseries 14,112 well grown young trees, which will suffice for about 80 miles of road, which is about the annual average length of avenue planted in this district."

I may mention that the pots in which young trees are raised should be buried in shallow trenches, each trench being long and broad enough to hold 400 or 500 pots placed as close together as they will stand in parallel rows. The rims of the pots should be slightly below the level of the surrounding ground, so that they may all be easily and cheaply flushed with water every two or three days during the hot season from an adjacent well. Between the trenches there should be narrow raised pathways by which the gardeners may obtain access to the trees. It will be necessary as the trees advance in height to turn the pots occasionally; otherwise the roots are apt to strike through the pots and to penetrate the ground. It is best to prepare the trench of the required length and breadth in the first place, next to arrange the pots in rows therein, and then to fill up the spaces between the rows with earth. Where flower-pots are as cheap as they are in Mozufferpore, viz., from Rs. 3 to Rs. 4 per 100, no hesitation should be felt about breaking each pot at the time of transplanting a young tree.

As regards the distance apart at which trees should be planted on roadside avenues, much depends on the kind of tree and on the locality. As a general rule, I would plant Pipul, Bur, and Rain-trees 50 feet, and all the others in the list from 30 to 40 feet.

If trees are not planted out by the sides of the roads until they are 5 or 6 feet high, and if they are planted out at the commencement of the rainy season, they will not require, in a climate like that of North Behar, to be watered in the following hot season. By that time their roots will have reached such a depth as to be able to dispense with artificial supplies of water, and nothing beyond general supervision and attention to the state of the gabions will be required. This duty can easily be performed by members of Road Committees, and the officers of their engineering departments. In drier parts of the country, it may be necessary to give water during the succeeding cold and hot season. And it may be advisable in very dry localities to adopt the plan of sinking a pot (kulsai) near the root of each plant, and keeping it filled with water at all times of drought during the first year or two after transplantation.

The holes in which the trees are to be planted by the roadside ought to be carefully prepared some months beforehand, and some old manure, where available, should be mixed with the earth. These holes should be at least $2\frac{1}{2}$ feet wide and 2 feet deep, but if money be available, larger holes, say 4 feet in diameter and 3 feet

When I left Mozufferpore district in December 1882, the total length of avenues on the district roads was about 210 miles, most of which were in very fair condition ; while along some 12 miles of roads in Mozufferpore town there were about 2,800 trees all of valuable kinds, which had been planted and maintained under my own immediate supervision at less than an average cost of Re. 1-8 per tree and most of which no longer required any special protection.—(*Indian Agriculturist*.)

Forests in Russian Turkestan.

According to the February number of the *Geographical Journal*, Russian Turkestan is so poor in forests, and the existing woodlands have suffered so much of late from reckless cutting, that attempts are now being made to replant, partly in the mountains and partly in the Steppes. It is estimated that of the total area of Turkestan (162,000,000 acres), the territory has but 945,000 acres of forest land in the mountains, and nearly 16,000,000 acres of bushland in the Steppes. As to the plantations of trees which are met with in all native towns and villages, they cannot even satisfy the wants of the steadily increasing population for building purposes. The saxaul tree has been pitilessly exterminated all along the banks of the Syr Daria, and for a great distance around the centres of population, and, as natives say, "the saxaul has fled into the depth of the Steppes." The forests in the mountains were also recklessly cut down till the year 1879. At the same time, the whole of the region is, from some physical change, generally undergoing dessication. Both glaciers and rivers are decreasing ; the lakes dry up ; the extremes of temperature become more marked ; and the moving sands are increasing in area. The recent attempts at planting forest trees, without irrigation, which were made in the province of Samarcand in 1880, have proved quite successful ; so also the attempts made in the dry Steppe in the south of Samarcand, between the Shaar-sabiz Mountains and the Dargh Canal, where nearly 400 acres were planted. Since 1880 the system has been improved, the young trees being now planted on the slopes of the hills in terraces, which follow the contour lines. (*Pioneer*.)

Old Dehra-Dunite News.

The Athletic sports of the Bengal Nagpur Railway Rifles, came off on the 2nd March at Nagpur when no less than five first prizes in addition to a special prize were won by Mr. J. P. Haslett, D. D. R., who is a Volunteer in the corps.

The prizes won by him were for the following events.

1st in the 100 yards flat race ;

" " " 120 " hurdle race ;

" " " $\frac{1}{2}$ mile flat race ;

" " " 200 yards flat race ;

" " " three legged race with Mr. Middleton ;

And the special prize given by Colonel. Wynne for the best all round man at the sports.

Mr. Haslett was running in very good form and with a little more training would be an excellent runner.

P. H. C.

Fellows of Coopers Hill.

We hear from England that the following old Coopers Hill Forest Students have been appointed ' Fellows of Coopers Hill,' C. G. Rogers ; B. B. Osmaston ; H. H. Haines ; F. A. Leete ; S. Carr. We offer them our congratulations.

Technical Education for Geologists and Foresters.

It is a noteworthy fact, which may be usefully borne in mind by the promoters of Technical Education, that the Government of India have, in the Resolution published in last Saturday's *Gazette*, declared that the system of appointing Asiatics as probationers in the Geological Department must be abandoned. The reason given is that habits of observation and practical inquiry are not sufficiently developed in natives by the present system of education. We are aware that the late Director of the Geological Department, Mr. Medlicott, took a still more hopeless view, and insisted that original investigation of high class could never be expected from the native of this country at all. The Government of India have never accepted this conclusion. Indeed, in the Resolution just quoted, they imply their belief that the qualities essential to independent and original work in the field of geological investigation can, and will, be produced by an improved system of school education. This view is confirmed by experience in the Forest Department, in which some of the students who have received a practical education in the field and in the museum, and whose powers of observation have been trained and stimulated by the instruction adopted at the Dehra Forest School have shown considerable aptitude for original research. It may be hoped that the reforms now being introduced into the general educational system of India, will remove from it the charge of being unable to turn out students fitted for the important work of scientific research, on which the future development of the wealth of the country so much depends.—(*Pioneer*).

Sapless Cedar Block Paving.

In a paper recently read before the Western Society of Engineers and printed in the Journal of the Association of Engineering Societies, Mr. Thomas Appleton gives a brief account of the manufacture and durability of the sapless cedar block paving, or, in plainer terms, a pavement of cedar blocks from which the sapwood has been removed, now in use in the town of East Saginaw, Mich. Prior to 1886 the cedar paving blocks used were sawn from peeled cedar fence posts, the bark and knots only being removed. On most of the streets of the town the travel was not heavy enough to wear out this pavement before it perished by decay. This decay naturally took place soonest in the sapwood, which, being softer than the heartwood, broomed up and wore away, leaving a rounded top surface to the block, and making a very rough pavement in a few years. It was therefore decided to try a cedar paving block with the sapwood removed. The first of this was laid in 1886, and since that time no other kind has been used. An examination of the sapless block paving laid in 1886, made in October, 1892, showed that the blocks were sound on all sides, and that there had been very little brooming. Details of the manufacture and cost of these sapless cedar blocks are given as follows by Mr. Appleton:—

In manufacturing the sapless blocks, the cedar is first sawed into block lengths. It is not necessary to remove the bark, as it comes off with the sapwood. The blocks are then taken to a press or punching machine. The bed of this machine has holes 4 in., 5 in., 6 in., 7 in., 8 in., 9 in., and 10 in. in diameter. At the top of these holes circular collars or knives are secured, standing up 2 in. or 3 in. above the bed plate. A block is placed on one of these knives, and the plate descending forces the block down through the hole in the bed, while the sapwood and bark is shaved off above the bed. The intention is to take off all the sapwood and no more, so that the attendant places the block over the largest die that he thinks the heartwood will fill. In case he misjudges the size of the heartwood, and the resulting block still has some sapwood upon it, the block can be punched again through the next smaller-sized die, and the sapwood entirely removed. Generally, the defective blocks as they come from the punching press are taken to a second machine, which has one straight knife and other knives of various radii of curvature, and these fit in the bed, and remove the sapwood and bark or any decayed wood that may be on one side of the block.

The block from the punching press has a very pretty appearance. Each block is a perfect cylinder, with sides straight and true. No knots or banches are left, so that they can be set close together in paving. Those that have passed through the second machine have equally straight sides, but their cross-section

is not always a true circle ; it may be a segment of a circle with a straight side. But there are plenty of places for split blocks, and long as the block are sound and free from sapwood it is not essential that they should all be exactly cylindrical.

The common cedar block is made only from small-sized trees, of such size as would be used for fence posts. The sapless block is made from any size of tree, large or small, solid or hollow-hearted. Any piece that has 4 in. of good heartwood goes into paving blocks, but the wood is all heartwood, and of good sound timber.

The average cedar block has from 25 per cent. to 35 per cent. sapwood upon it. Sap $\frac{3}{4}$ in. thick on a 7 in. block would make 24 per cent. sapwood. On a 4 in. block the same thickness of sapwood would make 34 per cent. of the entire area of the block. On some blocks the sapwood will run more than $\frac{3}{4}$ in. in thickness. Throwing away 34 per cent. of the material adds to the cost of the paving. A pertinent inquiry is, what does this sapless cedar block cost ? On the first piece of cedar block paving in East Saginaw the extra cost for sapless blocks was 10 cents per square yard over the cost of common blocks. Recent figures for sapless block paving in some of our suburbs give a difference of 30 cents per square yard. It is understood that this latter difference is largely due to the cost of railway freight from the block manufactory in Michigan. If the blocks were manufactured in this city just as the common blocks are, this difference of 30 cents per square yard would probably be reduced.—*Timber Trades Journal*.

The American cedars are species of 'Thuja'

Hon. Ed.

VII.—TIMBER AND PRODUCE TRADE.

Churchill and Sim's Circular.

MARCH 2nd, 1893.

EAST INDIAN TEAK.—Remains in poor demand, the deliveries for the first two months of the year being only 1,401 loads as compared with 1,725 loads, and 2,859 loads in 1892 and 1891. For February this year, the figures are 773 loads, against 883 loads and 1,500 loads in the two previous years. The market has hardly varied in price, what is wanted being more business. Future prospects largely depend on the volume and the direction of the Admiralty requirements; if any considerable proportion of the supplies from Burmah are absorbed by these requirements, markets will be by no means over pressed for some to come.

ROSEWOOD, EAST INDIA.—Have been rather more enquired for, but the sales effected have been at easier prices.

SATINWOOD, EAST INDIA.—Logs, if large and well-figured, would realise fair prices, but for *planks* and *boards* there is no demand.

EBONY, EAST INDIA.—No sales have been made, as the demand continues very dull.

PRICE CURRENT.

Indian Teak	per load	£9	to	£15
Satinwood	per ton	£5	to	£10
Rosewood	"	£5	to	£9
Ebony	"	£5	to	£8

MARKET RATES OF PRODUCTS.

(*Tropical Agriculturist, March 1893.*)

Cardamoms, Malabar	per lb.	2s.	to	2s.6d.
Croton seeds	per cwt.	15s.	to	20s.
Cutch	"	20s.	to	32s.
Gum Arabic, Madras	"	50s.	to	60s.
Gum Kino	"	110s.	to	120s.
India Rubber, Assam	per lb.	1s.7d.	to	2s.3d.
" Burma	"	1s.7d.	to	1s.11d.
Myrabolams, Bombay	per cwt	10s.	to	11s.3d.
" Jubbulpore	"	8s.9d.	to	9s.6d.
" Godavari	"	5s.6d.	to	7s.3d.
Nux Vomica, good	"	8s.	to	9s.6d.
Orchella, Ceylon	"	22s.	to	28s.
Redwood	per ton	60s.	to	80s.
Sandalwood, logs	"	£9	to	£30
" chips	"	£4	to	£7
Sapan wood	"	40s.	to	90s.
Seed lac	per lb.	9s.	to	1s.4d.

The Wood Trade in India.

The Report of the Special Commissioner appointed by the Norwegian Government to inquire into the state of trade in India has been issued. According to this report wood is sold per ton of 50 cub. ft. and for a specification of Norwegian fir as follows, *viz.* : 25 ton $\frac{1}{4} \times 6$ in. actual measure ; 15 ton $\frac{3}{4} \times 6$ in. actual measure ; 10 ton $\frac{1}{2} \times 6$ in. actual measure, a price of £319s. per ton has been obtained. The Commissioner is of opinion that good trade might be established in staves, 3 in. \times 2 in. \times $\frac{1}{2}$ in. and has ordered samples to be sent from Scandinavia to India. At present the greater part of the trade is with Singapore. Ready made wooden houses sell well in India, but in this, says the Norwegian Commissioner " we cannot compete with the Swedes." (*Timber Trades Journal.*)

Did any of our readers come across the Special Commissioner when in this country ?

Hon. Ed.

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[No 5.

On Forest Administration.

The article "On Forest Settlement and Administration," which appeared in the March number of the *Indian Forester* deprecates the arrangement adopted in Madras of allowing Revenue Officials a large share in the administration of forests.

As a Madras Forest Officer who has been in charge of a district for the past 10 years, I say that I have found but few of the defects pointed out by "Futaie."

Futaie says that "the control of the Reserved, as well as of the Protected, is rapidly slipping, or has already slipped, away from the Forest to the Revenue Department." Here is the chief point in the whole article, and I propose to discuss it so far as Madras is concerned.

The management of forests in Madras is undertaken by

- (1). Government.
- (2). Board of Revenue advised by Conservator.
- (2). Collector of the District advised by District Forest Officer.

The latter has the chief management and working of the forests, of course, subject to regulations laid down by the two former. It is with the latter I propose first and chiefly to deal.

The Collector in Madras is, of course, *the* chief of the District, not only in the Revenue, but also in the Forest, Magisterial, Police, and almost every other Civil Department.

The question now arises, "Does the Collector stand in the way of the District Forest Officer, or does he help him?" I have been District Forest Officer under six Collectors, and can confident-

ly state that the latter is the case, at all events with the present generation of Collectors. The Collector of the present day thoroughly understands that the reservation of forests is beneficial to the people, and that the future agricultural interests are furthered by restrictions at present of so-called privileges, such as promiscuous fellings in the forests, excessive grazing, grassfiring, forest clearings and even the imposition of fees.

The present day Collector is not afraid of dissatisfaction occurring amongst the people in regard to Forest measures, provided those measures are not suddenly and immoderately introduced. Thus, in the course of a few years, thousands of acres may be closed to felling or to grazing without fuss or murmur if done gradually ; but, if done suddenly and all at once, this closure would probably cause grave dissatisfaction, and even riots. In these matters, the Collector is the Conservative, as compared with the Forest Radical : the brake on the coach to prevent its running down hill too fast.

It is absurd to say that the Collector only regards agricultural interests, as he is the head of the Agricultural Department, and does not regard Forest interests except from an agricultural point of view ; just as much as it would be to say that he does not regard magisterial interests, except from an agricultural point of view.

It is equally absurd to say that the Revenue Department has been "bribed to take right action, &c." Collectors are being shown that forest projects are interesting, and are interested accordingly, if matters are properly and thoroughly explained to them. They are being "physically educated up to a rational and 'impartial treatment of forest affairs.'" The question is rather, whether the average forest officer is "educated up to a rational and 'impartial treatment of agricultural and magisterial affairs.'" I think not, I think that his zeal over forest matters biasses him on that side ; and that he is not interested in agricultural matters. Perhaps if he were "bribed to take a right action by the concession 'of a larger share in the management' of agricultural and magisterial affairs, he might see that he has been so biassed.

The arrangement of the Forest Officer being an assistant to the Collector has a double effect. *Firstly*, it is my experience that the Collector is almost invariably willing to leave purely technical matters to his forest assistant; he is willing to learn all that he can about forest management, provided that the Forest Officer proceeds with tact and does not set to work either to lay down the law or to use long technical phrases, with which the Collector has no acquaintance ; he is willing to listen to his District Forest Officer's arguments and be guided by his opinion, provided he has no weighty argument in return. *Secondly*, the District Forest Officer hears the Collector's views on the subject, taken if you will, from an Agricultural or Magisterial stand point ; and he consequently sees both sides of the question.

The result is that Collectors take a proper interest in forest matters, and that Forest Officers take a more unbiassed view of their projects, which would not happen if they were independent of each other.

There are other ways in which the coalition strengthens the hands of Forest Officials. *Firstly*, the Department being under-officered, we constantly find young Assistants or Extra-Assistants of one or two years' standing at the head of affairs in a District. Presuming that this young Assistant is zealous in his work, he longs to make innovations and improvements, pooh-poohs custom, considers that the thief of a head load of firewood is a greater villain than a house breaker, or swindler, &c. &c. : who could better restrain him from making himself and the department a laughing stock than a kindly Collector, who knows enough about young men to do it without hurting his Assistant's feelings ?

Again, without the Collector's authority, Tahsildars have a nasty way of acquiescing in proposals to get a thing done, but six months or so afterwards furnishing a most plausible reason why it should not be done. The time lost is generally, by Europeans, considered valuable.

Again, the Collector being head of the Local Fund Board can often have roads and buildings, most useful to the department, constructed from Local Funds.

Again, the Collector, when visiting localities where Subordinate Magistrates, reside, can, as District Magistrate, explain to such Subordinate Magistrates that forest offences should not be treated as trivial one or two anna offences.

Thus, a great deal can be gained for the Department by the Forest Officer being Assistant to, and technical adviser of the Collector.

It is true that lately the Board of Revenue have taken upon themselves the control of finances which formerly vested in the Conservator. The reason for that was patent and need not be referred to here. But the Conservator being adviser to the Board should, I think, with tact and rationality, even now, have as much control over those finances, as it was ever intended by the Code for him to have.

Finally, the concluding part of 'Futaie's' article seems to some extent to approve of the coalition arrangement existing in Madras ; for he wishes a Forest Official to be Joint Secretary to Government. The Collector has the District Forest Officer, the Board of Revenue has the Conservator, and why should not the Local Government have an Inspector-General, to advise ?

Deodar in Kulu.

The most important tree of the Himalaya, the Deodar, is not unfrequently found mixed with the two Pines, the two Firs and the three Oaks, the Moru, (*Q. dilatata*) the Ban, (*Q. inrana*) and the Karshu, (*Q. semecarpifolia*.)

In Bashahr, the tree extends to the vicinity of the arid zone where it is often found associated with the edible pine (*Pinus Gerardiana*) which latter is the most characteristic tree of the dry climate.

Pure Deodar forests are not rare in Kulu. Such forests are found either on abandoned fields (often in the vicinity of Deotas' temples); on land where, I believe, shifting cultivation had previously been practised; or in steep and generally inaccessible localities where they have not been subjected to ill usage at the hand of man. All these classes of pure forests are generally regular.

That loose soil is always the best suited for Deodar is quite apparent from the fact that Deodar encroaches upon adjoining fields with such a marked rapidity, that in a single year acres will be covered with an almost continuous mat of seedlings; the result being that if such fields are not taken care of for a few successive years, they will have ultimately to be given up by the holders.

As a matter of fact, Deodar seed would always germinate very readily where the soil is sufficiently loose and moist, but the young seedlings growing in the open, where they do not find sufficient shade, dry up again in the succeeding hot months. Those exposed to the south are less likely to survive than those growing on other aspects. It is mostly on account of the absence of such shelter that Deodar sowings in patches in the unshaded areas, have, except in a few rare cases, where a couple of succeeding seasons have been exceptionally favourable, almost always resulted in failure.

In such open and unsheltered localities I would recommend that the *Blue pine* should always be raised, before Deodar sowings or plantings are taken in land. The Blue Pine would cover such grounds very quickly, and would, of course, nurse and force up the Deodar when the latter is introduced there. The desired result may be thus very soon obtained.

In many a grassy land throughout the valley, wherever firing had been put a stop to, if the situation were in any way favorable and the seed trees were not far distant, the young growth of *Kail* subsequent to the occurrence of the latest fires reminds one of the *Rakhs* of the lower hills where the forest fires always result in a beautiful crop of young seedlings of *Dodonæa viscosa*. It may be advisable, therefore, to set fire to all such open lands before *Kail* seed is sown there. But patches to receive seed should always be kept prepared beforehand. Deodar seed is heavy, some 225 grains per ounce. It often falls close to the seed bearers. As most of the pure Deodar forests in Kulu lie amongst cultivation, whenever a

sufficient number of seed bearers fringe the outskirts of such forests, it requires no labor or time to find the adjacent fields full of seedlings.

Unless such parent trees are removed by some untrained hand, the seedlings would do well under them and very few of them are likely to fall victims to the heat and dryness of the following seasons. Thus, if left alone, Deodar would go on extending itself till it had occupied the whole of the cultivation.

The occurrence of pure forests standing on deserted lands may be attributed to the Deodar thus spreading from the sacred groves surrounding the Deotas' temples or from a group of trees in fields.

The Deotas in Kulu, whose presence in the low lying Deodar forests probably accounts for the existence of the latter, have been, from time immemorial, much dreaded by the people.

The plants coming up from the seed shed by the trees of the sacred groves, were sometimes held to be the property of the temples, and owing to fear of and respect for the Deotas, the cultivators made no attempts to destroy them.

All forests which thus sprang up, have been of late years in possession of the Forest Department.

In fact, the people in Kulu always looked upon the Deodar as a temple tree and without the previous permission of the Deotas it could not be obtained.

For every tree they thus removed, they had always to pay either in cash, in goats, or in grain. Since the management of the Kulu forests has been in the hands of Government, it has been ruled that Deodar may not be claimed even on payment.

It is also probable that the district was once more thickly populated than it now is. All the old fields now occupied by Deodar were once cultivated, but the successive invasions of the Goorkhas, the Mandi people and the Sikhs, resulted in their being deserted, the consequence being, that wherever seed bearers were at hand, the whole of the deserted fields were taken up by Deodar.

It is on this account that most of the present low-lying Deodar forests of Kulu are often of uniform size and age.

The present year (1893) has been exceptionally favorable to the natural growth of Deodar in Kulu. The winter of 1891 was an abnormally dry one, it was therefore followed by a good seed year.

There was hardly a single Deodar tree in the valley which did not bear cones in 1892. A large quantity of Deodar seed was shed in November-December, 1892, and thanks to the spring rains, every seed seems to have germinated.

Thus, the natural reproduction, so far, is very satisfactory, but the next season may be perhaps comparatively dry. Consequently, more than 95 per cent. of the present seedlings may fail to survive.

On the other hand, if the succeeding years prove to be favorable for these young plants to establish themselves firmly, we

shall have, without any labor, some of the bare grassy lands covered with Deodar plants of equal age.

A few regular and pure deodar forests, found in localities where probably the people used to burn down the jungle in patches to take off it a few crops occasionally, have had their origin, I believe, in this manner. But quite different is the history of pure Deodar forests found on steep slopes or at high elevations.

As a representative of this class of forests, may be mentioned the Rolla and Drad forests of Sahraj, where hundreds of Deodar trees grow pure on rocky ledges in a comparatively poor soil. All such forests were, in the beginning, I believe, either mixed or pure forests of Pine and Spruce. Deodar which somehow or other got introduced there, drove out all these species, thus forming pure forests of its own. A good example of this may now be seen in the mixed forests of Mahli Dhar and Bung in Sahraj, where Deodar has already begun to establish itself and is expelling all other species. In the course of the next few years, Deodar is sure to dominate and ultimately to suppress all its companions—the Chil (*P. longifolia*) the Kail (*P. excelsa*) and the Rai (*A. Smithiana*)—and the forest will become one of pure Deodar.

But the most dangerous companion of Deodar is the Silver fir. If all other circumstances are favorable, the Silver fir would naturally keep the Deodar back altogether. With the exception of this enemy, I would never recommend that any of the usual companions should be ringed or otherwise removed. I would always leave the trees to fight their own battle.

Young seedlings of Deodar are, of course, readily browsed by goats, but when once it starts fairly, it cannot be easily suppressed. About the sapling stage, however, the condition it loves best is a side shade through the influence of which the Deodar would clear itself rapidly of its lower branches and attain tall boles.

Pines, Oaks and Rhododendron when mixed with Deodar, are the greatest safeguards against fires, as they keep down the undergrowth of grass and of more worthless species and also greatly increase the production of the soil.

As a rule, and naturally so, the reproduction of Deodar in Kulu in the mixed forests of Deodar and Pines is usually plentiful, while that of the latter is invariably conspicuous by its absence, because no seedling of pine or even of spruce would ever stand shade.

Both Oaks and Pines and sometime Spruce are therefore the most useful companions of the cedar, inasmuch as they always foster it when it is young and simply disappear when they are no longer required.

Once the Deodar forms a thicket and throws out its powerful leader, it would grow in any soil under even the most unfavorable circumstances.

In bad and poor soils the trees would not, however, attain their normal size, as is the case in Dugruthana Shila, Paneo, Bohara and a good many other forests and sometimes if they

do attain the usual dimensions, they would begin to decay at the centre at a comparatively very early age, as is the case in Dalogi forest, where although the trees are very tall and clean boled, they have already begun to rot at the centre and probably in a few years hence none of them will be found healthy and sound.

It may also be due, to some extent, to the evil consequences of the removal of dead leaves and consequently to the absence of nitrogenous substances that the trees in the Dalogi forest have thus begun to decay ; but if the soil were deep enough, they would not, I believe, have suffered so much through the absence of humus.

On the other hand, the Deodar, when it once sets out fairly in deep clayey or loamy soils, would always stand even the most serious injuries.

As an instance of this type of forests, may be mentioned the Kalandi Dhar forest of outer Sahraj, which, when the Mandi people conquered that part of Kulu and set fire to all hamlets on that side was, probably, composed of straight Deodar poles.

The moment the invaders left the country, the people began rebuilding their houses. For this purpose every available pole in the above forest was cut away. The stools left behind were not, however, without side branches. As soon as the leader was off, the remaining branches turned up to form a number of leaders, the result being that the present growth at first sight resembles a coppice.

Similarly, whenever in rich soils the leader of an old tree gets injured, the tree does not die out, but the nearest side branch turns up to form what is termed a secondary or a false leader. Such trees are found in almost every old Deodar forest in Kulu.

As the care and proper supervision of Deodar will have the special attention of the Forest Department, no Deodar forest should ever be *clean cut*. I would recommend that all Deodar forests should be treated by selection felling, while we must be very careful to cut as few trees as possible on the steep slopes.

I doubt very much the advisability of Deodar sowing *in situ*. It is, I believe, more satisfactory to raise the plants in a nursery.

The principle, therefore, which we must never lose sight of is to have seedlings ready at hand to put out just after the felling operations are over and to give the forest perfect rest.

Sometimes, when a virgin forest is felled over, where the undergrowth is very scanty, and where the soil is full of humus, sowing broadcast or in patches may succeed.

The bad effects of the policy of falling back on artificial reproduction for filling up the areas denuded of Deodar by very heavy felling, after having given in vain, for years, sufficient light and air to allow a young growth to spring up, are quite apparent in the Nachar forest in Bashahr, in Daogi and Jibi in Sahraj, in Bindraban and Phulga in Waziri Rupi, in Sandhar and Bain Padru in Upper Kulu and a good many other forests.

In all these areas heavily worked over, all conditions combined together have been very favorable to the luxuriant growth of *Desmodium*, *Indigofera*, *Berberis*, Brambles, *Viburnum* and numerous other weeds. Such worthless species are now found occupying every foot of the ground and if a Deodar seedling comes up anywhere, they would overshadow it and would thus retard its growth.

We cannot possibly get rid of such inferior species by cutting off or ringbarking. The best means to clear them away, in order to re-stock the areas with Deodar, would be, I believe, in raising a tree which would readily come up under such circumstances. Deodar should always be introduced later on. Regenerating all such ruined forests otherwise would be a matter of time and heavy expense.

At present, it is most difficult to find in any of the above forests, any traces of natural reproduction at all, while the artificial sowings and plantings, have not produced the desired result, except where such operations were taken in hand just in time, as was the case in some patches in Nachar in Bashahr, where Col. Bachelor had sown some Deodar seed broadcast, just when felling operations were going on and the worthless species had not yet time to spring up; and in the upper portion of Latura Forest in Kulu.

The natural reproduction of Deodar in forests lightly worked out is generally good.

As an instance of this, may be mentioned the Blajdhar Forest of Sahraj. In is in such forests that the tree may be encouraged by artificial means.

Our aim must be always to re-stock and improve the forests, and therefore all badly growing and topsore trees should be removed at once.

Subsequent to fellings and the removal of suppressed trees, all blanks must be filled up as soon as possible and invariably before the inferior species have had time to come up.

As a rule, no forest should ever be worked unless we have got in nurseries at hand, a sufficient number of Deodar plants ready to be used at once wherever necessary.

Almost all the workable Deodar forests in Kulu have been of late years somewhat heavily felled over. The Kulu forests are still unclassified forests, the late lax rules of the Department have also much added to their present state of depletion.

The trees which escaped the Departmental axe were not rarely removed and utilized by the Zamindars, the consequence being that the present forests have been to such an extent exploited, that Kulu will hardly be able, for a good number of years to come, to supply for felling more than fifty Deodar trees a year.

The young Deodar forests of Kulu are, however, well stocked, while the plantations in the Upper Valley, where thousands of Deodar plants have been raised artificially, are, of course, of very great value and show the masterly hand of the Forest Officers.

In about forty years time the Kulu Division will yield annually the largest number of Deodar trees in the Punjab.

Nearly all these natural young Deodar forests have come up in spite of grazing. I am strongly of opinion, therefore, that moderate grazing by cows and bullocks does not do any damage to the young reproduction of Deodar. The cows would hardly touch the plant, even if there is nothing else for them to eat.

The present young Deodar forests standing on lands close to villages in Kulu, and of necessity grazed over by cattle almost every day during the whole time the plants were young and the grass had not yet died out, lead me to the belief that cow grazing does not much interfere with the young growth of Deodar. As a matter of fact, I would not allow grazing of cows on slopes, but when the most ruined forests on almost flat and abandoned cultivations have to be re-stocked, where the needles if not triturated under the feet of cows form a thick covering of undecayed vegetable matter and the soil becomes matted with weeds and inferior species, almost the only means to encourage natural reproduction is, I believe, by allowing moderate grazing. My belief is greatly intensified by observation. I find that all such areas heavily felled over and subsequently kept fenced and closed have thus got full of needles, weeds and worthless species, and it is sometimes quite in vain to search for a single natural seedling.

Great care should always be taken in gathering seed. If raw and unhealthy seed is sown we can never expect success. The cotyledons of healthy seed are generally green and if they are not so, the seed must be considered in an unhealthy state. As a rule, the seed should always be collected from isolated trees. The seed of such trees is generally good and when sown hardly ever fails.

The age at which Deodar trees in Kuluatta in workable girth, varies with soil, aspect, altitude and other circumstances.

It is probable that the following figures give a fairly accurate average.

GIRTHS.

4' 6' to 5 ft. AGE.	6' to 6' 6"	to 7' 6"	to 8' 6"	to 9' 6"	to 10' 6"	to 11' 6"	12'
50 years.	88	100	115	132	152	180	195-200

From 30 to 35 years are probably sufficient for trees of 4½ feet in girth to attain a girth of 6 feet. This cannot, however, be said to be the case in general.

In some compact pure forests where the Deodar grows close together, the trees may grow to a considerable height but they would hardly ever attain large girths. As an instance of this type

of forests, may be mentioned the Dalogi Forest of Sahraj, where, although the trees are very tall and the whole crop not less than 300 years old, the average girth is hardly above 6½ feet.

MIAN MOTI SINGH.

Kulu, 8th April, 1893.

The Commutation of privileges in Bahraich.

The following notes on a scheme for commuting the wood privileges of villagers resident within 3 miles of the State Forests of the Motipur Range, Bahraich Division, Oudh Circle, may interest the readers of the "*Forester*."

AREA AFFECTED.

The Local Government, in its Notification No. 441, dated 7th May, 1879, granted villagers resident within 3 miles of the boundary of the State Forests, the privilege of taking poles of the inferior kinds of trees for their own *bonâ fide* domestic and farming purposes free of charge, and of grazing their cattle in the State forests at reduced rates, but reserved to itself the right of discontinuing these concessions whenever it pleased. These privileges can only be exercised in the "Open Forests," the area of which in the Motipur Range is about 68,556 acres out of a total area of 1,18,776 acres. The greater portion of the "Open Forests" (*viz.*, over 60,000 acres) is situated on the low alluvial plains of the Rivers Ghogra and Kauriâla and consists chiefly of grass lands interspersed with khair and shisham trees. This area is used chiefly as a grazing ground and is not capable of supplying timber such as is required by the villagers, and consequently this demand has to be met from the remainder of the "Open Forests," with an area of about 8,000 acres. This tract comprises the three open compartments which form part of the main sal Forests, *viz.* :—the Bahay Forest, the open compartment between Motipur and Kakraha, and the open compartments between Dharmanpur and Jallia gourhi; the two latter compartments contain a considerable quantity of sal, and all three are protected from fire but open to grazing.

PRESENT METHOD OF EXPLOITATION.

Under the present system, the privileged villagers are entitled to as much timber, &c., as they require for their domestic and farming purposes, and the only restriction imposed by Government rules as regards locality, manner of cutting, &c., is that the produce

must be taken from the open Forests. There is no attempt at any systematic plan of working, nor can the Forest officials enforce the simplest sylvicultural rules, or take any precaution against wanton and destructive methods of exploitation; for, so long as they obtain a permit, the concessionists have a perfectly free hand in the open Forests; blanks are increased; trees are ruthlessly cut away without regard to the state of the soil, reproduction, &c.; and the over-head cover is opened out to such a degree as to expose the soil to climatic influences, while all protection in the shape of grass and undergrowth is destroyed by cattle.

INJURY DONE BY THE CONCESSIONISTS.

The damage thus done to the present crop is enormous, while the deterioration of the soil is so great that forests which have been thus maltreated for any length of time, are incapable of producing good growth in the future. A striking example of the irreparable damage done by allowing ignorant villagers to have unrestricted liberty of cutting trees in valuable Forests, is shown in the case of the Bhinga Reserve in the Bahraich Division. The soil of this once magnificent sal producing area has been impoverished to such an extent by over cutting and excessive grazing, that it is impossible for it to produce another crop of sal unless artificial means are resorted to; and when the present stock of sal either dies from natural causes or is removed, this forest will be reduced to the status of a scrub jungle covered chiefly with thorn bushes, and be incapable of even supplying the demands of the privileged villagers.

AMOUNT OF TIMBER AND POLES REMOVED ANNUALLY.

To give an idea of the drain on the forests open to concessionists, it may be mentioned that there are 110 "privileged villages" adjoining the Motipur Range, the residents of which extracted 92,676 poles and 15,791 other pieces of timber from the open forests of this Range during the year 1891-92, while (as has been explained above) the greater number of the 108,467 trees were removed from an area of about 8,000 acres. It might be thought that each supply of building materials would last at least 3 or 4 years, but this is far from being the case, as indents for the full amount of their requirements are received annually from the householders; and when questioned on this point, they state that the wood which they now obtain, being immature and of inferior quality, decays every year. The forests are thus burdened annually with the full requirements of 110 villages. Under these adverse conditions of excessive felling and grazing, the denudation of these forests is merely a matter of time and it is with a view to check this destruction, to reduce the total exploitation by 4-5ths and if possible to re-establish the fertility of the soil, that the present proposals are suggested.

PROPOSED FUTURE WORKING.

To better understand these proposals, it is necessary to describe briefly the future system of working in this Range, so far as it concerns this scheme. A Working Plan is being prepared for these forests in which work will be prescribed for the three Working Circles described below :—

I. *Nishangara Working Circle*, which will include all the closed Forests from the Orai Nulla and the Nepaulese pillar No. 79 on the North, to the Jallia-Salarpurwa line on the South.

II. *Murtiha Working Circle*, consisting of the closed Forests between the Jallia Salarpurwa and the Bulcha-Bhamania lines.

III. *Motipur Working Circle*, containing the closed Forests from the Bulcha-Bhamania line to the Ghagowa Nullah.

The period for which work is being prescribed in these Circles in the present Working Plan is 15 years, and during this period improvement fellings will be undertaken annually in certain fixed portions of each Circle. The out-turn from these fellings will, in the first instance, be sold to lessees, but there will be large quantities of poles and suppressed trees available for supplying the requirements of the privileged villagers, and it is proposed to utilize this surplus stock for commuting the concessions under consideration. The timber thus set aside for the use of the privileged villagers, would consist chiefly of the better kinds of wood and be more durable than the wood of the inferior species now taken by them, and each householder's supply should last at least from 5 to 10 years. The coupes in each Working Circle will be marked a year before the felling is undertaken, and separate hammers would be used for marking trees for lessees and for privileged villagers.

PROPOSED RULES REGULATING THE SUPPLY OF TIMBER TO CONCESSIONISTS.

The following rules show the manner in which the concessions may be commuted without inflicting hardship on the tenantry, while the exploitations would be carried on systematically, and with due regard to the potential capability of the Forests.

I. Sal timber and poles will be supplied free to each householder once in 5 years from the coupes in which cuttings are prescribed in the Working Plan. In cases of arson, however, timber will be supplied again free of charge, although the full term of 5 years may not have expired since the last supply.

II. All the privileged villages adjoining the Forests of the Motipur Range will be divided into 3 groups (or "chucks") to correspond with the 3 Working Circles and each group of villages will draw its requirements from a particular Working Circle. It is proposed that this grouping of the villages should, in the first instance, be made by the landlords, who are best qualified to

ascertain the convenience of the tenantry, and then be submitted to the Divisional Officer who would satisfy himself that each Working Circle is capable of supplying the requirements of the group of villages attached to it. If the Divisional Officer is of opinion that the probable out-turn from any Working Circle will be insufficient to meet the demand on it, he will make such modifications in the grouping of the villages as the circumstances of each case necessitate, and communicate the alterations thus made to the landlords concerned.

III. When the village-groups have been finally settled, the Forest Officer will prepare a nominal list of all the householders, and a statement showing the quantity of building material, etc., required by each.

IV. One-fifth of the total requirements of each group of villages will be supplied annually from the Working Circle to which it is attached, the rotation in which individuals or villages are to be supplied being decided by the landlords.

V. On the 1st October of each year, the landlords will submit to the Forest Officer an indent for the quantity of sal timber required by the villagers of each group, such amount not to exceed one-fifth of the total as ascertained under Rule III.

VI. It will be seen that under these arrangements it will take 5 years to supply the full requirements of all the villages in each group; consequently, during the first four years, a certain proportion of timber required by the remaining villages must consist of miscellaneous species. So that for the first four years it will be necessary to send the Forest Officer 2 sets of indents, one for sal (as mentioned in Rule V) and the other for miscellaneous timber.

VII. By the 1st December of each year, the timber required by the indents mentioned in V and VI will be marked by the Forest Department, and the villagers will be at liberty to enter the forests and cut trees thus set apart for their use.

VIII. After the timber has been cut, it will be inspected by some specially authorized forest official who will enter in a register the amount of produce taken out by each villager and issue a pass for its removal.

IX. All the cutting and export must be completed by the 31st March of each year, after which date no one would be allowed to enter the Forests.

X. The privileged villagers would not be allowed to obtain timber or poles from any of the forests in which grazing or firing is permitted, and could only cut and remove timber from the closed forests in accordance with these rules.

XI. Thatching grass might be cut in closed forests between the 1st October, and 28th February, on permits which would be supplied free by Rangers and Foresters.

B. A. REBSCH.

A New Fodder for Cattle.

An article has recently been published in '*Le Temps*' by M. Grandeau, Professor of Agriculture at Nancy, on a new fodder for cattle. This fodder consists of the young branches of trees, more particularly of the Beech and Birch, previously submitted to a special treatment, which is described below.

As is well known, the constituents of a plant, whether it be an annual or a perennial, are generally speaking the same ; cellulose, nitrogenous matter, sugars, fats. The proportion of these substances varies largely from one plant or from one organ of a plant to another; the age of the plant or of its different parts is the chief condition which regulates these differences. In general, the younger an organ, the richer it is in digestible nutritive substances. The reserves of nutritive material formed in special parts of a plant at certain times of the year, are destined to support the life and development of a new plant or a new organ until it is itself able to derive its own nourishment from the soil and the atmosphere. In the autumn, there is a considerable accumulation of such materials in the young branchlets; from which supplies, the young shoots of the spring derive the food substances necessary for their growth. The inner wood of the tree, on the other hand, contains practically none of these nutritive substances: nitrogenous matter, sugar, fat or starch. It is composed almost exclusively of hardened cellulose, more or less incrustated with mineral matter, and practically without any nutritive value.

Frequent trials have long ago been made to substitute partially for hay and straw in the feeding of cattle, sawdust, either crude or previously treated with various chemical agents. These trials have shown that sawdust is harmless as a food and does not cause disorders in the animals fed on it, but at the same time, that it is absolutely inferior as a food to the poorest straw. The first point is important, in so much as the perfect innocuousness of introducing the elements of woody tissue into the digestive organs of horses and cattle is established. As regards the second point, chemical analysis shows that wood richest in nutritive matter is not, weight for weight, equivalent to more than a quarter or a third of the nutritive value of the poorest straw. In speaking of the instinctive dislike cattle have of this kind of fodder, M. Grandeau mentions the well-known criticism of this method of feeding by a Norwegian Agriculturalist, who said that a peasant who had been recommended this regime for his bullocks, has only been able to persuade them to eat the sawdust by providing them with green spectacles in order to make them think they were eating good chopped grass.

However inappropriate wood may be as a fodder, it is quite otherwise with small branches, gathered in autumn, chopped up

and submitted to a special process of fermentation such as that devised by M. Ramann. M. Grandeau gives a table showing as an example of the rule mentioned above, how the quantities of the different nutritive substances contained in the small branches (of a diameter not more than one centimetre) of the Beech vary according to the season. This table shows that such branchlets contain a very much larger percentage of albumen, fats and starch in the winter than they do at the time of the opening of the buds or during the growing period; and also that the general nutritive qualities of these are equivalent to those of hay of medium quality and greatly superior to those of the best straw.

To transform such branchlets into fodder M. Ramann has prescribed the following treatment. First, they are broken up mechanically by a crusher specially adapted for the purpose and which is not expensive, next they are submitted to a regular fermentation effected as follows. To the broken branches is added 1 per cent of malt, they are then watered with warm water and left to ferment. After a time, which may vary from one to three days, the temperature of the mass rises to 60° or 70° C., it should be maintained at a temperature of between 50° and 60° by stirring the mass, adding from time to time more liquid. The action of the malt transforms the starch into sugar, the other changes brought about by the fermentation are somewhat complex, but the final result is the production of a substance which is eagerly eaten by horses and cattle and very well digested by them. Experiments conducted on a large scale with this fodder on horses, cattle and sheep, of which several instances are quoted by M. Grandeau, have given excellent results, conclusively proving the superiority of the new fodder over straw.

The economy realized by this new method of feeding is also considerable; the gathering of small branches is not costly and takes away nothing from the value of the produce felled in a forest. The cost of preparation is estimated by M. Jena at from 1 f. 10 to 1 f. 75 per 100 kilograms.

Branchlets of fruit trees and small shrubs can, M. Grandeau thinks, be used with equal advantage in feeding cattle, and interesting experiments might be made with these at times when other fodder is scarce. M. Grandeau concludes his article with the remark that the Forest Department will doubtless see no greater harm in allowing the gathering of small twigs and branches from its forests, than in the removal of dead leaves for the benefit of small cultivators, permitted, in cases of necessity, in the forest regions of France. (*From Revue des Eaux et Forêts*).

A. F. G.

II.—CORRESPONDENCE.

The Blazer Question.

We have this month received several communications on this subject and as, if we simply content ourselves with publishing them, the matter may go on till blazers are out of fashion and the writers of the letters are too old to play tennis and sport colours, we consider it best to review the matter briefly ourselves and endeavour to make some sort of a practical suggestion towards settling the momentous question.

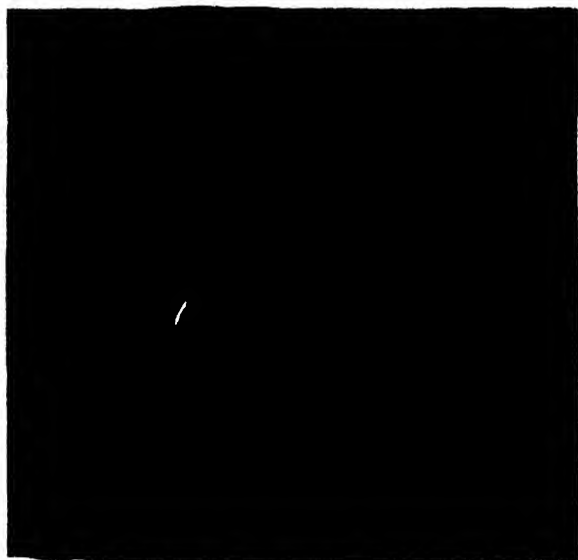
The sheet, shewing more or less truthfully, three patterns or designs, which we publish this month, was done from specimens of cloth sent to us. No. 1, an arrangement of greens with a pattern of tree stems shewing a style of pruning which we cannot quite professionally approve, is a Bombay design, started, we believe, by our old correspondent 'Velleda' who actually took the trouble to circulate it to all the Forest Officers of his Presidency, with some rather interesting results in the way of remarks. We will let 'Velleda's' own letter tell the story. We may say that we are not personally remarkably enthusiastic about blazers, considering that the fashion is going a little too far when every 'Arry' on the Margate sands sports a coat of many colours which may possibly be those of some club or other, but which, more usually, we suspect, represents only its owner's idea of what is really 'chic.' And besides, we believe that there are many Forest Officers who object to departmental colours altogether. 'Velleda' says :—

SIR,

I am sending you the pattern and papers at last. You will see that the pattern is approved by 7 votes, disapproved by 6, 5 men do not want any blazer, one or two rely on Coopers Hill, 5 suggest plain green, with or without badges of sorts, and 5 have not voted or have confined themselves to facetious remarks which may perhaps be interpreted to mean, that they will not wear one in any case. This is exactly the degree of unanimity that might have been foreseen. To the gentlemen who objected to "uniform," I would say that the question is not one of that nature at all, but



№ 2.



№ 1



№ 3

simply one of *esprit de corps*. Since the transfer to Coopers Hill, I am sorry to think that our *esprit de corps* has weakened. Indeed, two comrades who ought to know better, allude to the Coopers Hill blazer as synonymous with Forests. I would venture to remind these comrades that, however friendly their feelings towards Coopers Hill, they owe no kind of allegiance to the Public Works Department or Telegraph Department, and it is not even certain that Coopers Hill will always be the sole source of our Department. "Decadents" may think as little of *esprit de corps* as of a rag for which men have been (in their view) fools enough to lay down their lives, but these would-be cynics are in error. Merely as a commercial speculation, *esprit de corps* pays. It is the lever which moves the world. It is so important that our trades unions make it practically compulsory, and the law courts dare hardly say them nay. The Forest Department is emphatically not one that can afford to despise this weapon, and there can be no doubt that a blazer in common would be a distinct step in the direction of that unity which means strength. The institution of a blazer is, as some of our comrades have not failed to discern, a trifle; but they have possibly not considered that this trifle is not the end in view, but merely a step towards a greater end. After all, nearly every regiment and department in the country has its blazer, why should we alone loaf around, each man wearing a shred of Joseph's coat.

On the question whether the blazer should be reserved to the Imperial Service or extended to Extra Assistants, Rangers, &c., there is a majority of 10 to 4 in favor of the latter. Probably, some of the voters misunderstood the question in the sense of meaning Secretary of State's men *versus* other gazetted superior officers. I do not know that I should take much interest in a blazer that might be seen doing office in a Mamlatdar's Cutcherry, and I fancy the *esprit de corps* of native ideas is much too strong to be brought over to our side by any number of blazers. In fact, it would probably only tend to develop the modern principle that Jack is as good as his master, aye, and a—sight better.

As to the badge, a horn has been suggested. Why? Because it is used in Europe? The horn has never been in any way associated with Indian Forestry, and it has really about as much to do with it as a pair of crossed muskets. There is also the fatal objection that the horn is already appropriated to Rifle Regiments and Light Infantry. It is not a week since I saw a boating man (M. L. I?) with a green cap and white horn. If we want something unintelligible, let us have a monogram, of Chinese letters for choice, or a small extract from the Koran. But for grace and intelligibility I still think a well-drawn *tree* is not to be beaten. A decrepit one might be preferred, with crossed axes at the root symbolical of the precarious existence of the department.

If you could publish a chromo of the proposed colors, whether mine, or plain green, and call for votes* from all India simultaneously, some result might be arrived at before each Mamlatdar is *ex officio* D. F. O. for his taluka, and the trained officer reduced to the position of a felling foreman.

My substitution of the "ragged staff" instead of the plain straight line, has not been so popular as I expected, and has even alienated votes received last year. This, I confess, astonishes me, for the R. A. have a much more remarkable zigzag, and few blazers are as quiet in general tone.

VELLEDA.

Patterns Nos. 2 and 3 have been received from Burma. No. 2 is from Messrs Harman & Co. and No. 3 from Messrs Macfie & Co. The latter is the pattern of the 'lungyi' worn by Foresters and Forest Guards in Burma. We are of opinion that No. 2 is 'too terrible' as a bright gaudy pattern; but that No. 3, a quiet neat pattern of two simple greens is not at all bad. The Department might well agree to adopt it if it has one at all, and especially we understand that the enterprising Rangoon tradesmen referred to, have laid in a large stock of the flannel. We reproduce, with apology to our respected Chief, Jungly Billy's letter.

SIR,

As this matter appears to hang fire, I venture to send you a sample of flannel (in two shades of green) which has been laid in in large quantities by an enterprising tradesman of Rangoon. The flannel is exactly the same shade and pattern as the Burmese forest subordinate's uniform and as a blazer looks very well. I would suggest that this material might be accepted at once, leaving the question of a suitable badge for a future date. If it is difficult to arrive at a decision, would it be ruled out of court to ask our esteemed I. G. to call a committee on the subject formed of all Conservators, with Mr. Pigot as Secretary? We know our I. G. is a very warm supporter of the blazer, for he offered, I believe, to clothe not only himself but all his servants with one as soon as the pattern was decided. He cannot do more to prove his strong support of the movement.

JUNGLY BILLY.

*We shall be quite willing to receive from Forest Officer, post cards saying whether:

1. They desire a blazer at all.
2. If they desire one, what pattern they prefer, and to publish the information.

We presume it is known that the Dehra Dun Forest School and its Professors and students, past and present, have one already.

HON. ED.

III—OFFICIAL PAPERS & INTELLIGENCE.

A Second Note on the Potato Disease in the Poona District and elsewhere.

The experiments of 1892-93 are described in detailed in Mr. Mollison's note, which is appended. The methods and results of cultivation are there fully described, and in this memorandum only the general inferences to be deduced need be dealt with.

Last year's note elicited a good deal of enquiry, and among other facts of interest it was ascertained that the "bangadi" or ring disease was much more widely spread than was at first known. It has established itself throughout the Bombay Presidency including Gujarát, and has been found in the Nilgiris, at Bangalore, and in Bengal. There can be no doubt that preventive measures should be adopted without delay wherever the disease has made its appearance, and fortunately the results of the present experiments are encouraging as regards the practical steps to be taken.

Among other communications received from correspondents some useful information was obtained from Mr. DeJoss, Superintendent at Panchgani, through the Collector of Sátara. Mr. DeJoss found that burning the soil with vegetable material, the land having been previously well turned up with the plough and exposed to the sun, was effective to destroy disease-germs, and he succeeded in producing a crop of several varieties which was remarkably free from disease. Three of these were, however, plainly grown from newly imported stocks, and they were planted on the ridge system and not in beds as by native cultivators. Major Radcliffe, Assistant Commissary-General at Mhow, wrote recommending the pulling of the haulms and also suggested that the "Magnum Bonum" variety might prove strong enough to resist the disease. We have, however, as shown in Mr. Mollison's note, found other varieties superior to the Magnum Bonum, and the idea of pulling the haulms was based on the assumption that the fungus, as in the European disease, fructifies on the foliage of the plant, which is not the case. But Major Radcliffe's recommendation gains interest from the latest conclusions reached by Dr. Cunningham, which also point to the pulling of the haulms as a preventive measure, though on somewhat different grounds. Mr. Creighton Duff of Coonoor is pursuing a series of experiments with potash and other manures intended to fortify the plant-system against infection.

Dr. Cunningham's researches were this season obstructed in some degree by an unexpected difficulty, viz., by the failure of the diseased seed supplied to him for cultivation to reproduce the disease in the crop grown at Calcutta. Probably, the diseased potatoes decomposed so far in transport as to lose their power of germination, and only the comparatively healthy ones survived. In any case, it must on no account be taken as proved that diseased sets produced a sound crop because they were grown on virgin soil. No conclusion has been more clearly pointed to by the experiments and observations conducted in the field during the past two years, than that the disease is propagated from the seed as well as from the soil, and that if anything the first source of infection is the more dangerous and common.

On the other hand, Dr. Cunningham is inclined to a contrary opinion, microscopical investigation leading him to believe that the lesions in the tuber are of a secondary nature. The primary lesions, he writes, are those in the haulms, and it is the disturbance of nutritive conditions determined by these which occasions the pathological changes in the tuber. He says, "I should certainly be inclined to believe that the disease is maintained not by the use of diseased tubers as such, but as the result of planting either diseased or healthy ones in soil contaminated by containing portions of the haulms with their mycelial and specially their sclerotoid contents." It may be added in this connection that the brownish tinge in the haulm which was noticed last year as a chief diagnostic symptom, has this year been much less marked. But although the discolouration has been less striking, following on an absence of the previously observed tendency to the formation of sclerotoid masses within the larger vessels, it is always discoverable on section, Dr. Cunningham observing that in such preparations "the presence of abundant although generally isolated mycelial filaments comes out very clearly especially within the spiral vessels." In some young plants examined he found abundant mycelium in the cortical and pith tissues, whereas last year the fungal masses were noticed in the vascular system only. Pulling and burning the haulms might, apparently, tend to save the soil from infection, but it is doubtful whether this can be recommended in practice. The disease develops itself most a little below the soil surface, and extends downwards as well as upwards in the stem. When pulled, the stem breaks off at the main point of disease-developments, and as many germs would be left in the soil as would be removed.

The practical result of the Khed experiments of the past season is to show that certain varieties of imported seed can and do resist infection in a marked degree. The provisional inferences of last year were against this conclusion, but Mr. Mollison's experimental results have fully established it, and the cultivators of the district are eager to obtain seed from the new stocks at almost any price. Unfortunately, it is difficult to keep the cold weather seed

till the following winter, because of its tendency to sprout in the monsoon months, and it becomes necessary to grow a crop during the rains to provide seed for the main crop cultivation of the next cold weather. This rain-crop is not always as sound in cultivation as the dry-season produce, and here we find another cause tending to the deterioration of all stocks after they have been grown in this country for any length of time,

The "Bouillie Bordelaise" treatment of the land *before sowing* has succeeded in a very considerable degree, and there can be no doubt that flushing diseased land with the copper sulphate solution in the manner adopted in these experiments is specific as regards all disease germs which it reaches. It has been found in a large degree to protect sound plants from infection and to prevent the spread of disease from one plant to another. The treatment with caustic lime and soot has been inconclusive because the imported seed proved so robust that the failure of the disease to make headway cannot with certainty be attributed to the treatment adopted.

The same somewhat unexpected degree of success with the imported seed has prevented any very clear differentiation being arrived at with respect to the methods of cultivation followed. The ridge and furrow system, however, has not been proved to have the full advantage at first expected. This is probably due to the more rapid growth and maturing of the tubers in this country, the crop being ready in 14-15 weeks as against at least 20 weeks in Europe. The *bad* system with its superabundance of surface moisture, seems to enable the plant to effect the more rapid assimilation of food necessary under Indian conditions. But, on the other hand, it is extremely probable, as pointed out by Mr. Mollison, that the constitution of the plant is unfavourably affected by this luxuriance of growth and is more prone to disease in consequence.

The lesson so far learnt is that the disease may be largely checked by the use of the copper salt, but that reliance must chiefly be placed on the distribution of robust seed of the varieties which have been found most successful. It has also been found that the small cut sets used by natives induce weak growth, and that large cut sets or, better still, medium sized potatoes planted whole produce more vigorous seedlings. Great interest has been taken by native cultivators in the experiments, and they have shown themselves ready to take large quantities of seed at prices much over the market rates for the indigenous kind. There is therefore every prospect, at least in the Poona district, of our being now able to effect in the course of a few years a thorough change in the stocks cultivated, but it must be added that there is little prospect of inducing the rayats to give their land the needed rest from potato, without which all measures can only be palliative and no permanent cure can be expected

E. L. CAPPEL.

IV.—REVIEWS.

Annual Forest Administration Reports for 1891-92.

For the Punjab, Baluchistan, Ajmere and Berar.

The PUNJAB Report has not much in it of special note, the work of the year having been apparently uneventful, except that the Financial Results due to a quantity of timber having been withheld from sale in the previous year and disposed of in 1891-92, were especially good. The *gross* revenue of the Department was Rs. 10,20,074 and the *net* revenue Rs. 3,79,800, which is more than a lakh and a half above average.

The Government of India remark especially on the slow progress made in the preparation of Working Plans, but it would seem that a considerable amount of work was done in Bashahr.

The decision arrived at that old plantations like Changa Manga and Shahdera which have now passed out of the plantation stage into that of permanent forest, should be considered in future as forest, seems a correct one. It is doubtful whether our present system of distinguishing plantations from other areas is of much use : it certainly is difficult to keep up, especially as the views of different officers vary so much as to what is a plantation and what is only a work of improvement.

We note, with some surprise, that the coppice reproduction in Kalesar, the Sal forest on the North of the Jumna, was not bad even though it has been twice burnt ; and that the forest is being worked under strip fellings. We should have thought that, so far north, strip fellings would be rather dangerous, as frost is likely to be bad. This year, in the Dún, tall trees even have had their leaves blackened and their shoots destroyed by frost, and in open coppice areas the damage must surely be considerable.

There does not seem to have been, during the year, any attempt to increase the area of Reserved Forest in the plains districts, and the Punjab authorities appear to have faith in some mysterious benefit to be obtained by having 'protected' and 'unclassified' forests instead.

The BALUCHISTAN Report contains, as usual, several matters of interest and especially so is the order in the Resolution by the Foreign Department of the Government of India regarding the advisability of an increase of area. They say :—

"The area of State forests, which was augmented by 50 per cent during 1890-91, received an addition of only 5 per cent., or 4 square miles, during the year under review, the total reserved area at the close of the year being 82 square miles. The Governor-General in Council agrees with you in considering that greater progress might have been made. More energetic steps might have been taken to utilize in this direction the provisions of the recent forest enactments, and it was unnecessary to suspend or delay operations pending the assembly of the Forest Conference. The Thalli and Zarghun tracts were declared State forests after the close of the year, and early steps should be taken for the reservation of other forests in Ziarat and the Zhob District, or elsewhere as may appear desirable. The facts narrated in the Deputy Conservator's report are evidence of the rapidity with which unreserved forests are disappearing, and the Forest Conference has recommended the extension of reserved areas. The Government of India accordingly desire that the whole question should be systematically considered with a view to the reservation and conservancy of all tracts which, after due investigation, it may be found expedient to maintain permanently for the supply of fuel or fodder."

And it is satisfactory that General Sir James Browne, R. E., the Agent, in his own Resolution, draws attention to the decision recently arrived at by the Forest Conference of maintaining the Department on its present footing and "extending the reservation of natural forests throughout Baluchistan including Zhob, all grazing rights being, where possible, excluded wherever forests are reserved." The General summarizes the objects of the Conference and its recommendations as follows:—

"The main points which it was required to consider and report upon were—

- '(a) the coal and petroleum supply ;
 - '(b) the cost of establishing, maintaining, and exploiting forest and other reserves ;
 - '(c) the supply of water by artesian wells and otherwise, by which the cost of the production of wood-fuel might materially be affected ; and
 - '(d) the possibility of a system of procuring wood from Sukkur by rail and stacking it in cantonments, or utilizing it for current purposes.
- 'The conclusions arrived at by the Conference were briefly—
- '(a) that Government should be asked—
 - '(i) to continue the Siah Kach petroleum well ;
 - '(ii) to put down an experimental boring simultaneously in the Chapper Rift ;
 - '(iii) to sink an experimental well on a site to be selected and approved ;

- '(b) that the Government should maintain existing and 'future forest reserves in Baluchistan intact for use in 'times of emergency, that no Government Department 'within reach of the railway should purchase wood 'locally, but should be supplied from beyond the province, and that at least one lakh maunds of wood 'should be the military reserve of wood in Quetta :
- '(c) that Government should grant Rs. 10,000 per annum for sinking artesian wells.

'It was also decided that Government should take over and 'work on a scientific basis all coal mines in Baluchistan."

The chief addition to the reserves seems to have been the Wam Kach forest, an olive bearing tract of 2,320 acres, practically an extension of the Wam Tangi forest. Other olive tracts are to be examined and taken up if possible. There are now 82 sq. miles of Reserves.

In regard to 'cattle trespass' a curious difficulty seems to have arisen from the practice of driving lame or diseased camels into the forests, for the pounds will not receive them and the owners refuse to claim them until they get well. This is something like the difficulties experienced in Nellore and other Madras Districts from half wild cattle which are claimed by no one and which are very difficult to deal with.

The following remarks on natural reproduction are worthy of extract.

"In some places in the Sibi forests the vegetation is closing 'up so well that it is impossible to go through it. In the higher 'portions where the soil is clay, there is no new growth between 'the existing trees.

'The "Jal" (*Salvadora oleoides*) is so improving with protection 'that the fruit (*Samrapilu*) is abundant enough to attract crowds 'of the poorer classes, who, on payment of a nominal fee, feed 'themselves and their families on it for the three or four weeks 'during which it lasts.

'In the juniper forests of Ziarat and Quetta, protection is 'showing marked effect on the undergrowth ; in Zarghun, especially, the shrubs and grass are making great progress. It will be 'some years, however, before the soil is sufficiently enriched to 'support an advance growth of juniper, khanjak, and ash trees.

'There is generally a good supply of black soil under juniper 'trees, and with the improved growth of bushes, such as *Berberis*, '*Prunus*, *Lonicera*, etc., humus is forming under them also. 'Juniper seedlings seem to prefer stony ravines, where there is a 'little moisture. Seedlings of ash and khanjak are very rare, but 'of the bushes above mentioned fairly abundant.

'Measurements of thirteen trees made in September 1890, and 'September 1891, are here given. The juniper is a very difficult 'tree to measure well ; frequently it has several nearly equal stems,

or the top of the best has died or been cut, and another thinner stem is taking its place. With regard to girth, the difficulty is still greater, owing to the immense thickness of the bark, which frequently comes off in huge flakes. It will be seen that some of the girth measures are actually less in 1891 than in 1890, a fact which is explained thus: To measure a tree, the rough outside bark has first to be cleared away and a smooth space made for the tape; during the year more flakes of bark peel off, and the measureable girth at the prepared place is less than in the previous year. The greatest growth in height is 10 inches, and in girth $\frac{1}{4}$ inch. The observations of a single year are, however, of importance only as the commencement of a series, which will become more interesting and valuable with every additional year's record."

Measurements of Juniper trees, Ziarat.

No.	Sept. 2, 1890.		Sept. 12, 1891.		REMARKS.
	H.	G.	H.	G.	
1	14' 9"	11 $\frac{1}{2}$ "	15' 7"	11 $\frac{1}{2}$ "	These eleven are in the Ziarat Forest in a walled enclosure above the Mangi Ziarat road, except Nos. 8 and 9, which are just outside the walls; Nos. 3, 4 and 5 were not trimmed or cut in any way in 1890; the others were all more or less trimmed.
2	4'	4 $\frac{1}{2}$ "	4' 5"	4 $\frac{1}{2}$ "	
3	31'	2' 5"	31' 2 $\frac{1}{2}$ "	2' 4 $\frac{1}{2}$ "	
4	25' 6"	2' 3 $\frac{1}{2}$ "	25' 11 $\frac{1}{2}$ "	2' 3"	
5	3' 3'	4"	3' 5 $\frac{1}{2}$ "	3 $\frac{1}{2}$ "	
6	8'	3"	8' 4"	3"	
7	9' 10"	6 $\frac{1}{2}$ "	10' 6"	7"	Damaged near road.
8	2' 7"	2 $\frac{1}{2}$ "			Originally two nearly equal stems the smaller cut away.
9	5' 5 $\frac{1}{2}$ "	1 $\frac{1}{2}$ "	5' 10 $\frac{1}{2}$ "	2 $\frac{1}{2}$ "	Above water channel on Ghwoshki ridge on old camping ground. No. 10 had a flower bed made round it in 1890, which perhaps accounts for its growth.
10	6' 6 $\frac{1}{2}$ "	3"	6' 10"	3 $\frac{1}{2}$ "	
11	13' 3"	10 $\frac{1}{2}$ "	13' 3"	10 $\frac{1}{2}$ "	
12	6' 7"	2 $\frac{1}{2}$ "	6' 7"	2 $\frac{1}{2}$ "	
13	21' 1"	1' 7"	21' 11"	1' 7"	

The Baluchistan Juniper is *Juniperus macropoda*, and judging by specimens we have seen, its rate of growth is faster than that of the Himalayan kinds.

The revenue of the year was the highest to date, viz., Rs. 20,609: while the expenditure was Rs. 30,497 and the deficit Rs. 9,888. We are glad to see that the authorities are not aiming at making the forests self supporting. We imagine that many years must elapse and much improvement take place before there is any chance of that and meantime the surplus revenue of other Provinces can easily afford to pay for the deficit in Baluchistan and for the constitution of a forest estate in a country of such difficulty.

The AJMERE Report is chiefly a record of the famine, and the fact that with the exception of 331 acres only, the whole area was thrown open to grazing. The extra Assistant Conservator reports as follows:—

“The year 1891 has been an exceptionally dry year, the total fall of rain being not even half the average of ordinary years.

“The village waste-lands soon failed to afford sufficient pasture for cattle, and there was no remedy to meet unexpected scarcity but to fall back upon the Government Forest Reserves. At first the cutting of grass (for plough bullocks) was allowed for one month and ten days, and 323,840 bundles of grass and dry leaves were removed. Grazing was then permitted, and with the exception of 331 acres (exclusively belonging to Government), all the reserves were thrown upon. As many as 47,989 cattle were admitted against 26,359 cattle in the preceding year. The strain on the forest was heaviest, the acreage per head of cattle for six months being only 1.85 as compared with 3.39 in the past year. But this was unavoidable.

“Owing to the failure of the rains the grass crop was scanty, and after what was removed by villagers there was little left for grazing. But it was principally the dry fallen leaves from trees which have supported the cattle. Cattle of villages unaffected by the Government Forest Reserves had to be driven to distant parts of Meywar and Malwa, where alone pasture was said to be available. Many of these cattle are said to have already perished.

“In the absence of forests, few cattle would have survived and agriculture would have received a rude shock. The importance of having such reserves is now fully appreciated by all classes of people.”

We agree with the Government of India in thinking that it is matter for satisfaction that the people were led to appreciate the advantages of reservation and we hope they will as equally understand the reasons for it if cattle are excluded in years when there is no scarcity. The Chief Commissioner apologizes for the wholesale throwing open of the forests and promises to bear in mind the recommendation of the Government of India regarding protection from cattle in future.

The reports on artificial planting shew clearly the much greater success obtained from transplants than from sowings : cuttings seem to have failed.

Unlike Baluchistan, Ajmere gives now a surplus revenue, the results for the year having been Revenue Rs. 19,799, expenditure Rs. 13,986, surplus Rs. 5,813. In our opinion, the whole of this ought to be spent on works of improvement.

As in that of Ajmere, so in the BERAR Report, the grazing question takes the chief place, in our opinion. We quote herein the remarks of the Government of India, which will we think, be read with interest in a good many other places.

“The observations on cattle grazing contained in the Report and in your review, have been read with interest. Adverting to the remarks of the Conservator on these subjects, the Government of India consider that the refusal to allow grazing privileges to persons other than agricultural residents of the villages adjoining

the forests is warrantable, wherever scarcity of fodder exists or is apprehended. Cattle necessary for the *bona fide* requirements of the agricultural population, should usually be allowed the first claim to such grazing as may be available, but it is no part of the duty of the Forest Department to provide pasture for an unlimited number of animals, many of which can be of little or no service for agriculture and must die in seasons of scarcity. The cattle belonging to banjaras and other professional graziers, who rely entirely on the profits derived from milking and breeding, might reasonably, if admitted to graze at all, be charged a higher scale of fees than that demanded for agricultural cattle. It is understood that this subject will be especially treated in the Report for the current year."

The Conservator had specially reported that he had found the Amraoti Hills grazing area overrun by cattle belonging to breeders to the detriment of those who require grazing for their agricultural animals and we are glad to see that it is proposed to charge the cattle breeders higher rates. We have every sympathy with the importance of helping agriculturists to cheap and easily found grazing, but we have none for those persons who fill the forests with herds of miserable cattle, who take no precautions to select good breeding animals and who simply fatten on the lands which the Government provides for the benefit of the ryots.

The letter in which the Commissioner of the Assigned Districts, Col. Kenneth Mackenzie, C. I. E., reviews the Berar Report, is a very interesting one and shews that he has a great interest in Forest work and thoroughly appreciates the efforts of the Forest Staff, with all of whom he seems to be well and personally acquainted. We extract first of all, some remarks on the increasing demand for fuel for the Cotton Mills.

"What is causing denudation so rapidly is the demand on the part of Ginning Mills for fuel for their furnaces. These mills are starting up all over the country, even in so comparatively remote a locality as Pusad. They consume annually an enormous quantity of wood. To raise the rates of fuel, as the Conservator suggests, would punish the proprietors of those mills insignificantly, without checking denudation, while it would furnish a serious grievance to the country at large. The rich already greatly feel the rise in fuel prices, and the poor are in such serious straits that for the most part they are driven for fuel to rely on cattle droppings. The remedy lies in driving these mills to use coal, either by cheapening the supply from Warora or circling them with nakahs, which should specially tax the wood they get in at such rates that they would be driven to the Central Provinces—Warora collieries, at present the only open source of coal supply in our neighbourhood." And we conclude with his remarks on the formation of dew, a question which some of our readers will, we hope, discuss in our pages.

"The explanation given of the curious meteorological fact noted during the year, viz., an abnormally small dew deposit in the forests, mentioned in paragraph 130, attributes the cause to an alleged deficiency of moisture in certain winds that prevailed. This implies that the water given up by the winds is superimposed on the leaves as dew ; but I have understood that recent careful experiments in England have demonstrated that dew is only to be found on the *under* surface of leaves, and comes therefore not from the winds that blow above, but from the vapour given out by the earth below. If this is correct, then the absence of dew means not necessarily less moist land winds, but that the difference between the temperature of the air at night over the forest and that of the earth or the vapour given off by it was so slight as to fail to cause chill and a dew deposit."

The financial results of the year were—

			Rs.
Revenue	...	...	5,11,180
Expenditure	...	...	1,97,340
		Surplus	3,13,840

Notes on Forest Entomology.

We have received Nos. 1 and 2 of Vol. III of the useful 'Museum Notes' which are edited by Mr. E. C. Cotes. Although many of our readers will doubtless read these notes in original, we think it may be as well to extract a few of those which are most interesting from a forest point of view.

(1). In South India, Sandal is such a valuable tree that any disease in it requires to be most carefully investigated with a view to remedy. The following extract will be of interest to Forest Officers in Sandal Districts.

"A good deal of damage is said to have been done in 1891 to young sandal wood (*Santalum album*) trees in Mysore by a boring insect. According to a report, dated 13th July 1891, by the Assistant Conservator of Forests, Mysore, furnished through the Director of the Dehra Dun Forest School, this borer attacks both the stem and the roots, either killing the sapling outright or weakening it, so that it is liable to get blown over by the wind. Sandal wood yields an important revenue to the Mysore State, so that any damage done to the young trees is of consequence.

"The insect that seems to be chiefly responsible for the damage is the caterpillar of the moth *Zeuzera coffea*, Nietner, a species which occasionally attacks both coffee (*Coffea arabica*) and tea (*Camellia theifera*) bushes."

(2). The Dun is almost celebrated for its Mango gardens, but sometimes these gardens suffer from curious attacks now of insects, again of fungi, which are obviously detrimental to the

maintenance of the fruit supply. This was the case in 1891, many mango gardens having suffered from a small fly which damaged the young leaf shoots as described in the following extract.

"In April 1891 the Director of the Forest School, Dehra Dun, forwarded blighted shoots of mango (*Mangifera indica*), with the information that the whole of the mango trees in a large garden near Dehra were attacked, though, strangely enough, other trees close by had not suffered. The blighted shoots were aborted, so as to appear almost like a series of little green rosebuds upon the twigs. These false buds were found to contain mature *Psyllidæ* (i.e., minute fly-like Rhynchota allied to the Aphidæ). The insect has not previously been described from India, so it was sent to Mr. G. B. Buckton, in England, for determination. He has named it *Psylla cistellata*."

(3). Tamarind beetle: we extract. "From the Secretary to the Agri-Horticultural Society of India were received (6th July 1891) specimens in different stages of development of a Bruchid which attacks the seed of the Tamarind tree (*Tamarindus indica*) in Calcutta. The insect was submitted to Mons. A. Fauvel, who has kindly examined it and reports that it belongs to the species *Caryoborus (Bruchus) gonagra*."

(4). During the tours of the Forest School students, many interesting notes are often made on the entomology of the forests, and more especially since the entomology prizes have become a feature of the School Examinations. The following extract refers to the small beetles which burrow between the bark and wood of the blue pine trees which had been barked or girdled in order to relieve suppressed deodar beneath them.

"In May 1891 the Conservator of the Forest School Circle forwarded, from his camp near Chakrata in the North-West Himalayas, a log of *Pinus excelsa* attacked by a bark-boring Scolytid. This insect was said to have attacked some trees that had been girdled, and were dying. The specimens were submitted to Mr. W. F. H. Blandford who very kindly examined them and determined them as belonging to a species of *Polygraphus* near to the European form *Polygraphus pubescens* Linn. For an account of *P. pubescens* which Mr. Blandford thinks likely to prove similar in habits to the *Pinus excelsa* insect, see Eichhoff. Eur. Borkenkäfer, page 122, (1881)."

(5). Similar investigations have been made in other Circles, witness the following.

"In July 1891 a number of insects were received through the Director of the Dehra Dun Forest School, from the Officiating Conservator of Forests, Central Circle, North-Western Provinces and Oudh, with information that they had proved destructive to Chir (*Pinus longifolia*, in the Baldhoti plantations.

The specimens were found to comprise four species of Aorididæ (viz., *Chrotogonus* sp., *Catantops indicus*, *Caloptenus* sp., and *Cedulus* sp., all said to nip off the young plants, also

'numerous obscure Curculionidæ beetles and earwigs (*Euplexoptera*) said to be found in dying trees, and probably therefore of but little importance. The Acridid responsible for most of the 'nipping off of the young *chir* trees is probably the *Chrotogonus*, 'of which numerous specimens were furnished. This insect is a 'very common one in many parts of India, and has repeatedly 'been sent to the Indian Museum as destructive to crops, but no 'satisfactory method seems to have yet been discovered for dealing 'with it. The bran and arsenic insecticide, which is said to have 'been successfully used in the United States against some kinds of 'Acrididæ, might perhaps be worth trying. It is made by mixing 'together one part of arsenic, one part of sugar, and six parts of 'bran, with a little water to form a paste. It should be sprinkled 'over the plantation for the Acrididæ to eat; the greatest care, however, is necessary in using it on account of the poisonous nature 'of the arsenic."

(6). The large beetles of the family of the erambycidæ are among the most destructive of the borers which attack the *Sal* (*Shorea robusta*). The following extract refers to similar attacks on an Assam species of *Shorea* and will be found of interest.

"In August 1891 a block of *Makai* wood (*Shorea assamica*) 'was received through the Dehra Dun Forest School, from the Deputy Conservator of Forests, Lakhimpur Division, Assam. It was 'found to be tunnelled in all directions by Cerambycidæ larvæ. A 'full grown beetle emerged shortly after the block was received 'and proved to be closely allied to a specimen in the Museum collection determined by Dr. Lameere as *Neocerambyx holosericeus* (= *Eolesthes holosericeus*, Gahan). It differs, however, from this 'species, in possessing a series of spines on the antennæ. A 'specimen of the Cucujid *Hectarthrus brevifossum* Newm. also 'emerged in the rearing cage from the same block, and may, 'perhaps, prove to be parasitic on the Cerambycid.

(7). Black unwholesome looking sticky messes are often seen on forest and fruit trees, and most often on the orange and lime. The following extract refers to an unpleasant attack of the sort which affected the thorny bamboos at Dehra.

"In March 1892 specimens were forwarded by the Director 'of the Forest School, Dehra, of an Aphid which was found attacking the leaves of *Bambusa arundinacea* in the school compound. 'The insect covered the leaves with a black sticky gum which was 'in such quantities that it fell off in drops. The insect is unnamed 'in the Museum collection, and specimens have therefore been 'forwarded to Europe for comparative examination." It has since 'been named '*Oregma bambusæ*' by Mr. Buckton.

(8). "Insects said to infest the *Terminalia belerica* tree in 'the Thana district, Bombay, were forwarded to the Museum in 'February 1891 by Mr. F. Gleadow of the Forest Department. 'The insects were found to be of two kinds—(1) a Bostrychid borer, identical with specimens reported on by Dr. Gunther of the

British Museum as *Sinoxylon* sp., and (2) a small Cucujid which has been submitted to Mons. Fairmaire, who has kindly examined it and reports that it belongs to the species *Lamotmetus insignis*, Grouville. The Cucujid is not likely to do much damage, but the Bostrychid is very probably destructive."

(9). The beetle, the subject of the next extract, was discovered by the noise he made in carrying on his excavations in the specimens in the Forest School Museum. He might have had a grand feast and tasted the qualities of many kinds of woods had he not made such a noise over his work.

"Specimens of the Cerambycid beetle, *Stromatium barbatum*, Fabr., were forwarded to the Museum in June 1891 by the Director of the Forest School, Dehra, with the information that they had been damaging wood specimens in the School Museum. A block of khair wood (*Acacia Catechu*) that was forwarded with the beetles was found to have the whole of the sap wood riddled with tunnels made by the larvæ. These tunnels were tightly packed with the powdered wood that had been eaten out and probably passed through the digestive organs of the grub. The hard heart wood was untouched."

(10). "In March 1891, specimens of an insect, said to injure gall-nut trees (? *Terminalia Chebula*) on the Kambakkan hills, were sent to the Indian Museum, through the Dehra Forest School, by the District Forest Officer, Chingleput, Madras. The specimens proved to be little cone-shaped larval cases of a Psychid moth. They were a little larger in size but otherwise indistinguishable from the larval cases of the species *Babula grotei*, Moore, a species which often defoliates ornamental shrubs in Calcutta gardens."

(11). Finally, we will conclude with the following remarkable note on the red mites which may, we hope, elicit information to confirm Mr. Clifford's observations on the subject.

"A note written some years ago by Mr. M. H. Clifford, late of the Forest Department, has recently been found amongst some old papers in Dehra. According to this note, native hakims extract a kind of oil from the large velvety red mites (*Tetranychus* sp.), commonly known as *red spiders* or *Birbhoti* in the North-West Provinces. The oil is sold for medicinal purposes at a high price, and even the insects themselves fetch as much as a rupee per tola. It will be interesting to learn if anything further is known of the medicinal virtues attributed to this mite."

There can be no doubt that the information afforded by these very simple observations will be of great value to the Department, and we think that every advantage should be taken of Mr. Cotes' being at the Calcutta Museum to get forest insect phenomena investigated and information recorded as to the identity of the animals and the best means of encouraging them or repressing them, as the case may be.

(To be continued).

V.—SHIKAR.

"A trip to Bara Bangahal."

(Concluded.)

6th June.—Started early before sunrise to visit the gorges and cliffs west of the valley I went over yesterday.—The scenery is very wild and impressive. The cliffs and peaks are so pointed and steep, they look as if they would come tumbling down any moment. We spotted 3 Ibex high up one of the gorges, but the ground was too dangerous to permit of our stalking them. After breakfast, returned down the valley with the camp to Dalli Gote, where I had bagged the monster bear on the 4th June. Our road lay along the Ravi, which was covered over with snow 15 to 20 feet deep in places; the walking was easy, though dangerous, as even such thickness of snow will occasionally crack up and let one down into a rushing torrent below. Saw nothing else all day but an adder which we destroyed.

7th June.—Started at dawn for the Larum nala a perfect paradise for brown bear. The nala or both sides is covered with beautiful Blue Pine forests and occasional strips of Deodar with open glades where bears feed. We passed a shepherd *en route* who was bemoaning the loss of three of his sheep killed during the night by a leopard, I wished I had had time to stop another day to look up Mr. "Spots," but I was anxious to finish the inspection of this last nala, and get back to head quarters. Soon after getting well up the nala, we spotted a young brown bear which was undoubtedly the one I had had 9 shots at on the 5th June, for he was very uneasy, and would not stop to feed. While tracking him, I spotted a splendid old brown bear across the valley—so left the cub to settle down, while we hurried on to get up to the big one. After some difficult walking and scrambling over fallen trees and soft snow, we came right on to him, feeding in an open glade and bagged him after hitting him twice. It being now too late to skin him, we rolled him under a rock, covered him over with stones and leaves, and tied my handkerchief as a flag over his carcass to frighten away hungry foxes, and then hurried back to camp, which we did not reach till dark. Killed two more adders to-day.

8th June.—Was too fatigued last night to sleep well, so did not start on my rambles till late in the day. Just as I was sitting down to enjoy breakfast in the forest, I spotted a she bear, and two large cubs across the ravine. Leaving the breakfast to take care of itself, the Shikary and I started off sharp to get above them, I soon got within shooting distance, and bagged the she bear and one of the cubs, the other escaped before I could reload. A single barrel rifle is decidedly a mistake. Later in the evening I came across the cub again and bagged him and soon after, on our way back to camp got within easy shot of another very handsome bear which I was fortunate to bag too, making in all 4 bears to-day. The dark colored bears with silver tipped fur are far handsomer than the ordinary light redish colored ones.

9th June.—Was enjoying a Sunday morning in bed when I was awakened by the excited shikary who ran in to say he had spotted a bear opposite our camp—and that he was quite close. I certainly felt very disinclined to get up, for I had had enough bear shooting; however, it was time to get up, so I dressed leisurely and walked out to see it, which was across the stream running past our tents. The sweeper just then let go the dogs, who catching sight of Mr. Bruin hurried on to make his acquaintance and we much enjoyed watching the chase which was more exciting than shooting bears. Returned to Bara Bangahal village in the afternoon.

10th June.—Started early and pitched camp in the Dhanna Gote, first stage to the Thanesar Pass. Shot several snow pigeons en route; a dreary evening, raining hard; completed a map of the Bara Bangahal Valley, and was amusing myself cleaning up my guns and rifle to put away, as there was no hope of any more shikar once we had crossed the Pass, when there was suddenly a shout of "bear" from two or three of the coolies in camp. Running out with my rifle and getting over the broken ice covering the stream below us, I got a shot at what turned out to be a sheep-eating bear; he was a splendid specimen, but had a very mangy head, I had 5 shots at him before I could kill him.

11th June.—Up at dawn and after an awful climb of 5 hours through snow, and over rocks, we reached the top of the Thawasar Pass 16,729 ft. above sea level, at 11 o'clock. The view was most magnificent, nothing but snow all round us as far as the eye could see. The glare of the sun on the snow was awful, and I was glad to start on the downward journey after finishing my breakfast; the whole day's journey, which lasted till 5 p. m., was through snow; toboggging was freely indulged in by coolies and all and was certainly the easiest way of getting over the ground. Three of the unfortunate coolies suffered from the cold and the glare, and were almost blinded. Pitched camp at Jhoodi. This must be the end of "The trip to Bara Bangahal" for we had no more sport after leaving Jhoodi.

F. O. L.

VI.—EXTRACTS, NOTES AND QUERIES.

Sir Edwin Arnold, the Monkeys and the Cocoanuts.

Can cocoanuts be plucked from trees as one would pluck cherries or hazel nuts? Sir Edwin Arnold appears to think they can: in fact he says he has seen monkeys plucking them. His description of this interesting and unique occurrence may be found in one of those delightful articles which are now appearing from his pen in the *Daily Telegraph*, and of which the following is an extract. In writing about books of travel and how much they interested and impressed him when he was a boy; he says:—"Day after day I 'revelled in that rich feast of ocean adventure, and day after day 'wished more and more for myself also to sail the sea and to cast 'eyes upon those fair and various lands, those strange peoples, 'those lovely islands set like jewels in the silver of the main, and 'shining under such glad and warm skies. Especially do I 'remember one prodigious volume which described some old 'worthy's travels in India and which contained a plate that charged 'my imagination brim-full of wonder and interest. It represented 'a scene upon the Malabar coast, with the sea gently breaking 'along a sandy bay, the curve of which was fringed with cocoanut 'tropical vegetation. Monkeys were climbing the stems of the 'palms or perched in their frondage; and curiously shaped and 'coloured birds hovered over the edge of the waters or waded in the 'lagoons. It saturated me, that ancient picture, with the passion 'and the purpose to see India, some day and to study the trees and 'flowers and birds and beasts and inhabitants of such a surprising 'country. All which has since duly befallen, for books are mighty 'in guiding and controlling us. I recall one hot, silent memorable 'day in the Concan in India, when we came down from the hills 'where we had been shooting, to take passage in a pattimar for 'Bombay. We sat under the shade of the cocoa-palms by the edge 'of the rippling Indian Ocean. Where had I seen the beautiful, 'wild, quiet scene before? When had I before visited that sleeping 'sunny bay of the Malabar shore with its long curving lines of 'cocoanut trees fringing the blue water, its milky wavelets break- 'ing upon the golden sand, washing the shells and star fish and 'clumps of bronze sea weed and red rocks? What made the spot 'upon which I was certainly now for the first time planting my 'delighted feet, so impossibly familiar, so unreasonably known? 'I seemed to recognise every feature in the landscape and the sea- 'scape, the very boats fishing were such as I had viewed in the 'very same places, and the cut of the mat-sails on the trading bunks 'and the dress of the sailors and fishermen bore no new appearance. 'Puzzled and meditative, I was wondering if the Hindoo doctrine 'of former existences was indeed true, when my Mahratta shikari

‘called out, “Bandur lôk ! dekho sahib,” “Look at the monkeys,” Behind us, in a near clump of cocoa-palms, some of the four-handed folk were demurely ascending a tree full of nuts, and two of them were already ensconced in the crown *plucking of the green fruit*. In a moment I remembered. It was the veritable scene depicted in that old book of travels ! By accident—if anything in human life can be so called—my boy’s dream and desire had come precisely true. There was the place before my eyes over which I had hung entranced in the nursery, it was the actual spot realised ; if King George’s artisist had limned it by my side, he could not have hit off that lovely nook of Malabar with happier precision.’

G. E. M.

Corean Paper-Making.

A report of the United States Consul-General in Corea, treats of the manufacture of paper. This is one of the leading industries, for paper is highly esteemed, and always forms part of Royal presents, and of the tribute paid to China. Besides its use for writing and books, it is employed in a great diversity of ways. It serves as string, and in the manufacture of lanterns, fans, umbrellas, shoe soles, hats, boxes, and coats. It is also used for covering floors, walls, and ceilings, and, stretched on frames, supplies windows and doors. Corean paper is highly prized in China and Japan, and is especially sought for the manufacture of umbrellas. It is made, from a bush of the mulberry order (*Broussonetia papyrifera*), which is indigenous, growing in many parts of the kingdom, but thriving best in the moist, warm climate of the south. It is chiefly grown from cuttings for this especial purpose, and the wild and cultivated plants are said to be of equal value. The bark, which alone is used, is generally gathered in the spring, and it is boiled for a long time in water, in which a quantity of wood ashes has been mixed, until it becomes a pulp, the mass having been beaten during the whole time of the boiling. Fine bamboo screens are then placed in shallow wooden vats, and a ladleful of the pulp is evenly spread over the screen by a dexterous circular motion of the hand. This operation is repeated once or twice, or as often as may be necessary—the more frequent the operation the finer the paper—and the screen is allowed to drain into the vats until a proper consistency is reached, the drippings being thus saved. They are placed on a hot floor to dry. After the drying has proceeded far enough, the paper is again laid on a hot floor and ironed by hand. The long lines in the paper show strands of the bamboo screens, and their nearness, distinctness or absence indicate the fineness or otherwise of the paper. They are almost imperceptible in some grades of paper, while in others they are distinct and far apart. Paper is made by the Paper Guild, a numerous and prosperous association. The province of Chulla is the chief seat of manufacture. (*Times*).

TEA, TIMBER AND PRODUCE TRADE.**Churchill and Sim's Circular***APRIL, 6th 1893.*

EAST INDIA TEAK.—There has been some improvement in the demand during the month, the Dock deliveries showing 1,370 loads in March, 1892, and 1,723 loads in March, 1891. The deliveries for the first quarter of the three years have been respectively 2,771 loads, 2,963 loads and 4,582 loads. Prices, however, have dragged again somewhat, and the stock has increased. The gloomy outlook for the ship-building industries throws its shadow with depressing force over the Teak market, in spite of the ever growing popularity of the wood for more general purposes.

ROSEWOOD, EAST INDIA.—Small sales have been made without any further decline in prices, but the demand is not at all active.

SATINWOOD, EAST INDIA.—*Logs*, it large and well figured, would command fair prices and unsold sorts is limited to the parcel just arrived ; *planks* and *boards* there is no enquiry.

EBONY, EAST INDIA.—Sales are only occasionally possible.

PRICE CURRENT.

Indian Teak	per load	£9	to	£15
Satinwood East India	per ton	£5	to	£10
Rosewood	"	£5	to	£9
Ebony	"	£5	to	£7

MARKET RATES OF PRODUCTS.*(Tropical Agriculturist, May 1893.)*

Cardamoms, Malabar	per lb.	2s.	to	2s.6d.
Croton seeds	per cwt.	15s.	to	20s.
Cutch	"	20s.	to	32s.
Gum Arabic	"	50s.	to	90s.
Gum Kino	"	£16	to	£17.
India Rubber, Assam	per lb.	1s.7d.	to	2s.3d.
" Rangoon	"	1s.7d.	to	1s.11d.
Myrabolams, Bombay	per cwt	10s.	to	11s.3d.
" Godavari	"	7s.9d.	to	8s.3d.
Nux Vomica	"	8s.	to	9s.6d.
Orchella	"	22s.	to	28s.
Redwood	per ton	£3.	to	3-10s.
Sandalwood, logs	"	£35	to	£65
" chips	"	£9	to	£30
Sapan wood	"	£4.	to	£7.
Seed lac	per cwt	40s.	to	90s.

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[No 6.

Tea-Box Woods.

In a note on INDIAN WOODS FOR TEA BOXES, by Mr. Edgar Thurston, Officiating Reporter to the Government of India on Economic Products, which was published as an Appendix to the *Indian Forester* for November 1892, I find it stated that Messrs. Davenport & Co., of Calcutta, annually import from Japan some 1,500,000 boxes of red Pine (*P. Thunbergii*) of uniform tare, viz., 19 lbs., and with the dimensions 23" x 19" x 18" with 2" dovetail. There is therefore, it is said, a very great opening in Eastern India for the manufacture of tea-boxes from some good light wood, which, however, must be sold in Calcutta for not more than 14 annas each, and yet leave a margin of profit for both the producer and the middleman. The main points to be kept in view are, it is said, that the boxes must not be heavier or more expensive than the Japanese boxes, and that the wood must be sweet smelling, and free from all kind of taint, by which, I suppose, is meant that the wood must not have properties which will corrode the sheet lead with which the boxes are lined, and so allow the tea to get spoiled. Before, therefore, people can be induced to take up the trade, the right kind of wood must be found in sufficient quantity and in suitable situations. Sample tea-boxes made from Japan Wood were sent to the Chief Forest Officers of Assam, the Andamans, and the Pegu Circle, Burma, and they were asked to ascertain whether woods suitable for the purpose were obtainable in the forests under their charge; and Mr. Thurston gives a *précis* of their reports, and adds information on the subject already published in the *Indian Forester*. The Conservator of Forests in Assam had reported in 1883 that he had arrived at the conclusion that there was no wood in Assam which, if properly seasoned, would damage the lead in which tea is packed: if not seasoned, the extent to which different woods would damage tea-lead must vary greatly, almost any wood would spoil tea-lead if used without being seasoned. The Conservator now said that there was an abundance

of light tough wood, easily worked, and therefore suitable for tea-boxes in Assam, to meet an increasing demand, and he stated the localities whence a supply could best be drawn. The number of boxes made from Government timber at Tezpur and Lakhimpur had increased from 118,657 in 1888-89 to 394,127 in 1891-92, and the royalty paid to Government from Rs. 7,218 to Rs. 17,792. The rate of royalty is stated to be one anna a box : but at that rate the royalty for 1891-92 would be Rs. 24,633. It seems possible that the number of boxes is overstated by one lakh. Tea-boxes are, in Assam, generally made from *Semal* (*Bombax malabaricum*) and three or four other light and inferior woods, but Mr. McKee, the Officiating Conservator, says that only *Semal* is produced in sufficient abundance.—He thinks it is likely that the local saw-mills of Lakhimpur Darrang, and Cachar will before long supply the greater part of the box demand. All the gardens in those districts are now supplied by local mills, which obtain their timber either from the Forest Department or from private grants, and Mr. McKee says there are reasons for believing that the number of mills will be increased before long, as it is found that boxes can be supplied by them at nearly half the rate charged by the Calcutta houses, and of sufficiently good material.

The Deputy Conservator of Forests in the Andaman Islands reported that he had cut up a quantity of *Didu* (*Bombax insigne*, and therefore, it is presumed, a wood similar to *Semal*) for tea-boxes, and that these were valued in Calcutta, before being tenoned and morticed, at 14 annas a box. Mr. Carter, Conservator of Forests of the Pegu Circle in Burma, reported that there were two common trees which, when converted into tea-boxes, might possibly compete with Japanese wood in the Calcutta market and one of these was that of the *Bombax insigne*, mentioned by the Andaman Officer. Mr. Dansey, Conservator of Forests, Bengal, stated that, having regard to the nature of the country, the difficulty of obtaining labour for the ordinary requirements of the tea concerns, and the very few local species of any use for the purpose, he did not think it strange that Bengal should not be able to compete with Japan in the tea-box industry. The Kurseong Divisional Officer said that Tea Managers thereabouts, preferred Japan boxes, which when made up cost Re. 1-4 each, to those made from local wood which cost 1-1-4 to Re. 1-2-6. One of these local woods is stated by Mr. Gamble, in Vol. IX, 1883, of the *Indian Forester* to be *Semal* ; and in a letter to Mr. Thurston, Mr. Gamble said that *Semal* and other soft woods could be got in abundance and cheaply in the Chittagong forests and he suggested that the timber could be floated down to Chittagong and be there cut up by a tidal water-wheel mill and sent cheaply to Calcutta.

Finally, it appears from a list of tea-box woods used by the planters of the Kangra District, that *Semal* (spelled *Simul* all through Mr. Thurston's paper) is one of them ; and in a note to this

entry the reporter says that Mr. Gamble informs him that in the Dehra Dún, the planters all use Mango wood ; because all their tea goes to the Commissariat Department and the Military Department, which gets the tea for the troops, insist on Mango wood because the wood of the empty tea-boxes can be utilized.

The prominent facts noted in Mr. Thurston's paper are, (1) that boards, or shooks, of pine wood are imported in large quantities from Japan to be made up into boxes to hold Indian Tea, and that these, after coming thousands of miles by sea are sent hundreds of miles up country by rail, and though slightly dearer, are preferred to locally made boxes.

(2). That *Semal* and a few other Indian woods are light and good enough for tea-boxes.

(3). That *Semal* or the allied species, *Bombax insigne*, is used so far as available, along with other woods, for tea-boxes, in India, from the Andamans to the Kangra Valley, except in Dehra Dún.

(4). That the Japanese tea-boxes are made of Pine wood and that two species of Pine and two of Fir are used for the same purpose, and though these are strong smelling and more or less resinous woods, they appear not to be objected to by purchasers of Indian Tea.

(5). The reason why *Semal* is not used for tea-boxes in the Dehra Dún is said to be that nearly all the tea there produced goes to the Commissariat Department, and it is required to be packed in Mango wood boxes because these can be utilised when emptied.

(6). The boxes made from local woods, including *Semal*, in the Districts of Lakhimpur, Darrang and Cachar are said to cost not much more than half the price of boxes made from the Japan shooks.

As I have a considerable stake in one of the Dehra Dún Tea Companies, and as I know that a considerable proportion of the Tea of that Company is sent for sale to London and to Canada, where there can be no special demand for Mango wood, and as I have for years seen the groves of magnificent old Mango trees in the Dún being felled to meet the demand for tea boxes, I have been naturally led to think that the denudation might be somewhat lessened and perhaps the cost of boxes cheapened, if the tea for London and Canada were to be packed in boxes made of *Semal* wood, which grows, self sown, all over the Dún; and I have intended to suggest this to the Board of Directors of my Company. But, I now see that Mr. Thurston's paper suggests many other questions, which I think may be profitably discussed in the pages of the *Indian Forester*, and I will now proceed to name some of them.

The first question that occurs to me is that it is strange that the Forest Department in India cannot produce enough of timber

suitable for tea-boxes, and at a rate cheap enough. Is it not a pity that the tea industry of India should be so greatly dependent on Japan for boxes? From a letter addressed by Mr. J. S. Gamble, to the *Indian Forester*, published in the number for October 1883, it appears that teak wood was then the ruling material for tea-boxes in Bengal, and Mr. Gamble said:—"It is important that the utilization of indigenous woods should be encouraged, for it seems absurd that the vast forests of Assam and Cachar should be said to be unable to produce tea-box woods sufficiently cheaply to compete with teak wood from Burma." This leads me to inquire whether *Semal* trees are conserved in Eastern India, or cut out, to make room for more valuable timber. Further, if they are conserved, is any aid given to natural production by sowing, or propagation by cutting, which latter mode, I am told, is easy?

But, *Second*, is not the disgrace of having to import tea-boxes from Japan largely shared by the tea planters? And is not the loss, by increased cost of boxes, largely owing to their own negligence. Most tea estates have a considerable extent of land under forest, and *Semal*, is, I believe, universally distributed. Do the planters encourage its growth, and propagate it? If not, considering that the process is so easy, and the tree has so quick a growth, why not?

Third. This leads me to inquire whether Mango wood boxes are insisted upon by the Commissariat and Military Departments down country, as they are in the North-Western Provinces and Punjab.

Fourth. Supposing the case of a tea garden with no forest land: might not *Semal* be grown all over the garden, without injury but perhaps even with benefit, to the tea crop, as Sissu is grown in some gardens in the Dún. It is a tree with few branches, and does not give a dense shade. Would its roots interfere with those of the tea bushes, or would the shedding of the cotton-covered seeds on the bushes affect to any serious extent the plucking and manufacture of the tea-leaf. I think, as a rule, the seeding of the *Semal* must be over before there is much flush on the tea.

Fifth. In how many years does a *Semal* tree become large enough to yield planks fit for tea-boxes; and what is the weight of a tea-box of seasoned *Semal* wood, 23" x 19" x 18"? And how many boxes would a young tree, just fit to be felled, yield, at a cubic foot of timber per maund of tea, the rate given by the Assam Conservator of Forests? What is the weight of a Mango wood box of the above named size?

Sixth. I presume that the slabs and branches of *Semal* would be of use as fuel.

Another series of questions occurs to me with reference to Mango wood, though in putting them, I, perhaps, only show ignorance. *First*, all large Mango trees that I have seen, yield

only small inferior *desi* fruit and the size to which Bombay and other grafted mango trees grow seems limited. Is the latter fact because gardens of grafted mangos are all yet young and will they in time grow up into big timber trees, and be fit for tea-boxes?

Second. What is to happen to the tea industry in the Dún, and other districts, under the influence of the arbitrary Military Department when the old Mango trees have all been used up.

Third. Are *desi*, or timber-producing mango trees being systematically planted by land owners to take the place of the mature trees when felled and if so, has that been done ever since Mango wood boxes were insisted on; and when will *desi* trees so planted become fit for felling?

Fourth. Is the age of a large Mango timber tree known? If not, might not the Imperial Forest School authorities count the rings on a series of stumps.

Fifth. Ought not the Directors of Tea Companies, and owners of private gardens, to insist, in preference to Mango wood, in the interests of the Mango tree, as well as for economy's sake that *Semal* wood be used for all boxes in which tea is packed for export and local sale, and not for the Commissariat?

Sixth. If by the systematic growth of *Semal* wood and its use for tea-boxes, planters in the Dún and elsewhere could tender to supply the Commissariat at a cheaper rate than at present (one pice per pound might be of importance) might not the Commissariat and Military Departments abandon their insistance on the use of Mango wood?

Seventh. Seeing that one sort of pine, *Pinus Thunbergii*, is so extensively converted into tea-boxes, and that two other species, and two species of firs are to some extent used in the Kangra Valley, the tea of which has a good reputation, and also that boxes of these woods would work up usefully after they had been emptied of the tea, could not the Military and Commissariat Departments be induced to allow the tea they take to be packed in boxes made of pine or fir wood?

Eighth. Has any attempt been made by the Forest Department to introduce into India *Pinus Thunbergii*, which seems to be so eminently suitable for tea-boxes? If such attempt has been made, what has been the success, and when will the trees be fit for felling.

Ninth. Lastly, I am under the impression that there has been some attempt to make tea-boxes of *papier-mâché* or of cellulose; and as this material could be made of the refuse wood of the forests in India, its production ought to be cheap. Mr. Fisher formerly of the Forest School Circle and now on the Coopers' Hill (Forest Branch) Staff, some years ago told me that he thought it would pay to establish the manufacture of stock for paper-making in the Dún, and I imagine the same stock, with perhaps some cementing

material added, would do for tea-boxes. Can any of the readers of the *Indian Forester* say anything about this?

C. W. HOPE.

Dehra Dun, 10th January, 1893.

Since the above was written, I have seen a Dún planter who tells me that the Commissariat do not insist on Mango wood, and proscribe only *Semal*. Mango wood is used because it is the cheapest to be had.

C. W. H.

TEA-BOX WOODS

(Note by Hon. Editor.)

After reading Mr. Hope's article, we thought it best to try and obtain some more information on the subject of woods for tea-boxes in the Dún. It seems that planters are not unwilling to try *Semal* wood boxes, provided they are of the exact dimensions which the Commissariat Department insist on, viz, 26 in. \times 15 in. \times 13 in. the wood being $\frac{1}{2}$ in. thick. Such boxes, of mango wood, cost Rs. 0-13-3 each, with 6 pies extra for French wire nails. Mr. Hearle, the Dún Divisional Officer, estimates the probable requirements of the District at 12,000 of the above sized Commissariat boxes, 4,000 of 23 in. \times 20 in. \times 20 in. for Orange Pekoe and 3,200 of 21 in. \times 20 in. \times 20 in. for Pekoe : the two latter costing respectively, without nails, Rs. 1-5-6 and Rs. 1-3-6 each.

Mr. Hearle says that the shoe has certainly not yet begun to pinch and *Semal* wood to be brought into use, for at an auction sale held lately at Hardwar, 28 *Semal* logs, containing 298 cubic feet, were sold for Rs. 34-6 or nearly 2 as. per foot, to be taken to Meerut for indigo boxes such as are sold for 8 annas each.

Not very long ago a quantity of spruce fir wood (*Abies Smithiana*) was cut in the Datnir Forest on the Tons and taken down to the Depot at Dakhpathar and there cut up, pieces being distributed free to planters for trial. No one would, however, have anything to say to it, and the wood had to be sold off for other purposes. Spruce wood can probably be delivered on the Jumna bank in the Dún at 4 to 6 as. per cubic foot and in our opinion it is probably much the best material that planters are likely to find.

We have been favoured by Mr. A. Smythies with the following further note on the subject of the endeavours of the Forest Department to assist planters in finding a good tea-box wood, from which it will be seen that he is of the some opinion that we are, as regards the suitability of spruce fir.

"In October, 1885, some planks of various trees were supplied by the Forest Department to one of the largest tea gardens in the Dún; they had been carefully seasoned and with few exceptions they appeared suitable for box purposes. But enquiries shewed that in most cases the timber could not be supplied of

'suitable size, and conveniently situated for sowing up. Some of the wood was also too heavy. The kinds experimented on were Pádul (*Stereospermum suaveolens*), Kumhar (*Gmelina arborea*), Bahera (*Terminalia belerica*), Lessora (*Cordia Myxa*), Jhingan (*Odina Wodier*), Semal (*Bombax malabaricum*), Pula (*Kydia calycina*), Aonla (*Phyllanthus Emblica*), and Kharpat (*Garuga pinnata*). The latter was thought well of.

'Two years ago the price paid for a Mango-wood box 27 in. \times 16 in. \times 14 in. was 12 As. 6 P. and the number of trees estimated as the annual consumption in the Dún was 250 to 300, with a five years' supply in hand. Since then, however, the price has risen; and it is not likely that the Dún can yield another three years' supply at the present rates. The total requirements of the Dún Gardens in planks 6 in. \times 11 in. \times $\frac{1}{2}$ in. were estimated at that time to be two thousand five hundred scores. It behoves the planters, then, to experiment on a large scale with some other wood than Mango, and the probability is that the spruce fir, well seasoned, would answer their purposes; there is any amount of it to be had in the forests beyond Chakrata, and it could be floated down the Tons and Jumna, and delivered at Dakhpathar. The day is not far distant when they will be compelled to use some other wood than Mango, and if Semal is objected to by the Commissariat Department, there is no reason to make us think that Spruce fir would share the same fate. At all events we recommend them to make the experiment while there is yet time."

What is really wanted is for the planters to take the matter up themselves. The Forest Department is, we are sure, in spite of Mr. Hope's remarks, anxious to assist them, but after all, its chief business is production, and planters who desire an improved supply of wood, must meet it half way and at any rate say definitely what it is they want to be supplied with, whether in Assam or in the Dún.

HON. ED.

Experiments on the durability of various woods, made at Dehra Dun.

In order to obtain some data on the durability of Indian woods, the Government of India in a Circular No. 45F. of October 31st 1879. para 6, ordered these experiments to be started. Specimens of various species, chiefly those common in the Dún and adjoining hills, were prepared, the size and shape of a metre-gauge Sleeper being chosen as most suitable. These were placed in the ground at the Imperial Forest School, one half of each piece being left exposed, the other half under ground: and in all 39 species were thus treated, most of them being put down in 1881

and a few subsequently at different times. The soil in which the sleepers were buried was a rich sandy clay, giving, on a rough qualitative analysis made by Instructor Mr. A. F. Gradon :—

Sand	...	...	...	...	35	per cent.
Clay	...	...	...	...	24	"
Organic matter	...	...	...	...	5	"

One by one, the weaker and softer kinds disappeared, under the effects of rot and the attacks of white ants : and in August 1892, just eleven years after the commencement of the experiment, the surviving pieces were dug up by the Deputy Director, Mr. Smythies, in the presence of his class of Forest Utilization, with the following results.

Three species had their wood still perfectly sound in every respect, both above and below ground. These were (1) the Himalayan Cypress, (*Cupressus torulosa*) 10 years buried; (2) Teak, 9 years buried; and (3) Anjan (*Hardwickia binata*) 7 years buried. Both Deodar and Sissu after 11 years burial had their heartwood quite sound, but the sapwood has been entirely eaten away by white-ants. Next to these came the two species of Eugenia, Piaman (*Eugenia operculata*) and Jaman (*Eugenia Jambolana*) which lasted well for 9 years but are now beginning to show signs of decay. Sandan (*Ougeinia dalbergioides*) was much the same, as were also Toon (*Cedrela Toona*) and *Albizzia procera*. The Toon was almost untouched above ground, but the buried parts were unmistakeably traversed by the mycelia of fungi. Sain (*Terminalia tomentosa*) and *Albizzia Lebbeck* lasted 8 years; *Phyllanthus Emblica*, *Adina cordifolia*, *Cedrela serrata*, *Pinus excelsa* and *Abies Smithiana* remained good for 7 years and then succumbed. *Pinus longifolia* and the three oaks (*Quercus Semecarpifolia*, *incana* and *dilatata*) lasted 6 years. *Aegle Marmelos*, *Stephegyne parvifolia*, *Abies Webbiana* and *Schleichera trijuga* remained good for 5 years. A *Grewia* lasted for four years, while *Lagerströmia parviflora*, *Anogeissus latifolia*, *Acacia arabica*, *Butea frondosa*, *Aesculus indica* and the Mango gave way in 3 years time. It is as well to place on record that Dehra Dún is the broad valley at the base of the Himalaya and between it and the Siwaliks, extending from the Jumna to the Ganges. The altitude of the locality is just about 2,100 feet, the climate is moderately cool and the average annual rainfall 73 inches.

The most remarkable thing about these experiments is the durability of the Cypress, a fact which ought to be remembered in planting trees in the hills, for few trees are so easily grown, even down to the plains in the Dún and further still to Saharanpur. The wood is not unlike deodar, but with a quite different strong scent. The tree thrives best on limestone, but is not really very particular and it grows straight and well in close plantations.

II.—CORRESPONDENCE.

Edible Ferns in Kashmir.

SIR,

It may interest your readers to know that the "adder's tongue" (*Ophioglossum vulgatum*), is much esteemed by the villagers in Kashmir as a *sdy*. It is very common just now in the Salab Valley. They take out the tongue and cut the leaves only and their name is *chonchrú*; one of my officers has a very good Hindu Cook and he sent me up a dish of various kinds of *sdy* cooked in his own way, it contained, besides the above, various others including dandelion and all tasted very well indeed. The villagers also eat the young fronds of *Aspidium aculeatum*. This is the time for camping in the Kashmir Valley, weather delightful and the villages lovely, with thousands of pear, apple, peach and plum trees in full bloom.

1st May.

J. C. McD.

Flowering of Baib Grass in Oudh.

SIR,

It may be of interest to note that the bankhas or baib grass in the Oudh Forests commenced flowering on the 15th March this year, or fully three months before the usual time. The abnormally cool and wet spring may be held accountable for this; and it may also be possible that continual protection from cattle and fires together with the annual *cutting* of the baib crop might in favorable climatic conditions, such as the present season, permit of a double crop in the year. The flowering clumps of bankhas are noticeable for the shortness of the grass. In Oudh where the export of bankhas for paper making alone amounts to some 40,000 maunds annually, with prospect of further increase, this question is of importance and I will be glad to have your opinion on the subject. The paper mills lay much stress on length of fibre and it is also self evident that the cost of collection of short-fibred grass would be heavier.

S. E. W.

Failure of Sal to flower in Assam.

SIR,

Could you or any of your numerous readers inform me through the medium of your Journal why scarcely any sál trees have flowered this year throughout the whole district of the Gáro Hills and in half of Goálpara? Have any of the following causes affected the flowering?

- (1). Excessive seed of sál in the last year.
- (2). Abnormal temperature of the current year on account of excessive cold, early and copious rainfall.
- (3). Frequent hailstorms in this season.
- (4). Devouring of leaves by a species of caterpillar.

5th May, 1893.

JOGESWAR SUR.

The Blazer question.

SIR,

I see from your April issue that Bombay Foresters are considering the question of adopting a "Departmental Blazer" of one pattern, while in Burma another coat has apparently been adopted. The Coopers Hill Foresters have their own coat or coats, and I think there is or was a Nancy pattern. In to-day's *Pioneer* it is said that "the Forest Service are about to start a Departmental Blazer" but that the promoters are in a difficulty. Will you permit me to suggest in your pages that as there are, it is understood, a considerable number of foresters who are strongly opposed to the idea of a "Departmental Blazer," the promoters should take steps to ascertain whether the Forest Service as a whole really wishes for anything of the kind. A postcard of enquiry to every Forest Officer whether European or native of the grades above that of Ranger (if indeed it may be assumed that Rangers do not wish to wear the Service colors) would not cost the promoters much and might settle the question. My own view is that, as the Coopers Hill men have had for years past their own Blazer, and as they will in a short time practically constitute the "upper ten" in the Department, the matter might be left to settle itself, as in the D. P. W., by the adoption hereafter of the R. I. E. C. Blazer.

"WHITE FLANNEL."

29th April, 1893.

IV.—REVIEWS.

Forest Administration Reports for 1891-92.

For Assam, the Andamans, and Burma.

The *Assam* Report shows a gradual improvement in the finance of the forests of the Province, the *gross* revenue of the year having been Rs. 3,36,129 and the *net* revenue Rs. 68,604.

The year 1891-92 is the last one in which the Assam Forests will have been worked under Act VII of 1878, for from April 1892 the new Assam Forest Regulation came into force. This Regulation has no class of 'Protected Forests' so that, as the Conservator says, "what are now *protected* forests will henceforth be transferred to the reserves or included under the head of 'unclassified forests and waste lands.'" This should make a considerable addition to the Reserved Forest area.

In reviewing the Bengal Reports, of the years 1890 to 1892 we noticed the difficulty that exists in obtaining good forest subordinates in that Province: we see that Mr. McKee experiences the same difficulties as Mr. Dansey, for he says:—

"Forest service is not appreciated here, and we are dependent on Bengalis for the grades of ranger and forester; and if Bengal finds it difficult to obtain good men on the pay available in that province, it must be obvious that we must find it still harder to obtain fitting subordinates of the same class on a scale of pay slightly less than the average quoted by Mr. Dansey, who complains that his rangers are paid an average of Rs. 56 per month, as compared with Rs. 65 in the North-Western Provinces and Oudh, Rs. 70 in the Central Provinces and Punjab, and Rs. 74 in Burma. But in Assam our rangers are paid an average of only Rs. 55 a month."

Doubtless, the reorganized scale which we are confidently expecting to be speedily sanctioned, will improve matters, meanwhile we see that the Conservator is able to select several Bengali subordinates for special commendation.

Noticeable among the changes of the year is the promulgation of a new Regulation for Sylhet, on which the Report says:—

"It may be noted here that an important Regulation came into force during the year, called the Sylhet *Jhum* Regulation of

'1891, whereby Government has proclaimed its intention of commutating all the shifting and ill-defined forest rights of *jhum*, *gurkati*, *tippera*, &c., that up to date have been claimed, and, in many cases, exercised, over large areas of forest waste land in the district, and which have been an important stumbling block in the way of forming reserves, or of granting a clear title to land for cultivation therein."

If we are not mistaken, there are other parts of India also where some such *jhum* commutation arrangement would be of great advantage.

On the question of the natural reproduction of *Sál*, the Report has some interesting notes which we reproduce. "In the *Sál* forests of Goálpára and the Gáro Hills, seedlings were also noticed to be fairly plentiful in all likely places; and the *Sál* forest constantly exhibits sure, if gradual, signs of encroaching on the adjoining grass *maidans*, and especially of spreading and establishing itself in the neighbouring belts of mixed deciduous forest. This latter feature is very marked in the strip of mixed forest that stretches along the foot of the Bhutan Hills, and divides these latter from the extensive *Sal* blocks of the Eastern Duárs. In this locality, the *Sál* is gradually, but most undoubtedly, replacing the dry deciduous forest; and although relatively scarce in quantity, its seedlings are far more conspicuous than those of any other single species, except perhaps *Makriah* (*Schima Wallichii*), which is always, in these forests, a constant companion of the *Sál*.

In some of the older forests of the Gáro Hills, however, seedling reproduction is disappointing. In many parts of Dambu it is almost entirely absent, a fact which may be owing to the very overmature condition of the high forest and seed-bearing trees, and which will entail the very greatest care in the selection of trees when the opportunity arrives for working this forest. The latter fact is made clear in those places where timber was felled by contractors a few years back, when the work was evidently carried out to meet the convenience of the lessees and with little or no regard for sylvicultural requirements, in consequence of which, the forest, which consisted almost entirely of mature trees, has been clear felled, and its place taken by a dense tangled mass of useless undergrowth, in which *Sal* is conspicuous by its absence."

Under "Artificial reproduction" the most interesting point is the very quick growth of teak at Makum which is thus described:—"Mr. Fordyce reports that the two acres of experimental teak plantation at Makum no longer require any attention. Twenty dominant trees were selected and measured, the two largest, which are only 16 years old proving to be of dimensions as follows:—

' Height ...	...	82 feet.
' Girth ...	...	3 " 6 inches.
' " ...	...	3 " 2 " "

' These measurements beat results obtained at Nilambur on the Madras West Coast."

Perhaps some of our subscribers in Madras can refute the latter statement and give us information from Nilambur which will supplement that given in 1878 (see Manual of Indian Timbers) and next year (1894) give as the growth of the trees planted by Mr. Conolly which will then reach their half century Jubilee year.

The question of the India Rubber trade naturally takes an important place in the Assam Report: the outturn of the year was 4,227 maunds and the receipts were Rs. 25,585. But there is clearly a good deal of theft, for we read that:—"The right to collect the product has been farmed out to contractors, who have hitherto paid considerable sums of money for the privilege. Lately, however, many complaints have been made that the Assam forests are not nearly so productive in rubber as heretofore, a fact doubtless owing partly to the reckless method of working employed by the contractors and their agents, and partly to the unprotected and inaccessible situations of the rubber tracts, which have enabled the adjoining hill tribes to illicitly tap the trees and import the rubber into Assam free of duty as foreign produce. Almost while writing the above, a report has been received from the Divisional Officer of Darrang, Mr. Copeland, describing how he has just found the Government forests on the frontier full of foreign rubber tappers, who have come down in a systematic way, in separate gangs, each under a *Sardar*, and heavily tapped nearly all the trees growing within a few miles of the border, the work being done at night. The leases having now expired, the question of how best to collect this head of revenue in future has formed the subject of a separate reference which it is believed has been forwarded for the consideration of the Government of India, and need not be further alluded to in this report."

The working of the 'Agar' tree (*Aquilaria Agallocha*) which had been relaxed for awhile, is about to recommence, as new localities for it have been found in Sibsaagar and the Naga Hills.

We will conclude by quoting the following important paragraph on the subject of woods for tea-boxes, a subject which has lately been discussed in one of the useful appendices which we owe to Mr. E. Thurston. "As the industry of tea-boxes from sawmills is rapidly extending in Assam and obtains a good deal of its raw material from Government forests, it may be useful to record a statement as follows, showing what the outturn and value of the trade has been during the past four years:—

Year.	Number of boxes. Large.	Number of boxes. Medium.	Number of boxes. Small.	Total number of boxes.	Cubic feet.	Royalty paid. Rs.
' 1888-89	112,329	...	6,328	118,657	86,778	7,218
' 1889-90	95,291	1,023	9,670	105,984	75,898	6,305
' 1890-91	139,272	11,422	13,457	164,151	116,118	9,659
' 1891-92	347,499	24,738	21,890	394,127	282,986	17,792

‘ It will be seen from the above that the demand on our forests in this connection has more than doubled during the above period. The produce chiefly required in the mills consists of inferior timber such as Simul (*Bombax malabaricum*), Kadam (*Anthocephalus Cadamba*), and Kokan (*Duabanga Sonneratioides*), all of which are quick-growing trees ; and as the industry has every chance of developing and becoming permanent in this province, it may soon be necessary to reserve certain well-situated areas for the special purpose of supplying this particular demand which at present is concentrated almost wholly on unclassed forests.”

The *Andamans Report* records the damage done by the cyclone of November 1891 which has already been described in our pages ; and informs us how a beginning has been made in the selection and demarcation of permanent reserves under the policy recommended by Mr. Hill in 1891.

The valuation surveys to ascertain the quantity of Padouk available, give the following results per square mile.

Trees 30 in. in diameter and above	...	...	502
“ 24 in. “ “ “	...	...	35
“ 18 in. “ “ “	...	...	12
“ 12 in. “ “ “	...	...	18

but the area gone over was only 614 acres.

The cleaning for reproduction around Padouk seedgivers still goes on steadily and it will be interesting in the future to hear the result of the operation, as it will also be with the plantation work of teak and Padouk seedlings.

The chief depôts for timber sales are still Calcutta, Madras and London. In Calcutta 63 tons of Padouk were sold at about Rs. 60 per ton, and 18 tons of gurjan planks at Rs. 45 per ton. At the Madras Depôt the prices obtained were less, reaching only Rs. 41 per ton for padouk and Rs. 35 per ton for gurjan, while pyimma squares brought in Rs. 47 per ton. In London 1,530 tons were sold and realized £7-16 all round, as against £6-12s.-9d. in the previous year, the price being apparently regulated by the colour, which should be dark.

The financial results of the year were good, viz :—

				Rs.
Revenue	...	...	...	2,72,338
Expenditure	...	...	...	1,79,908
				<hr/>
Surplus	...			92,430

The Review of the *Burma Reports* by the Government of India, records merely an account of steady progress in forest work, but little of special note for us to mention. They remark, however, on the large increase made during the year in the extraction of

other kinds of wood than teak, chiefly due to the larger demand for sleepers and shingles of pyinkado (*Xylia dolabriformis*) and pyimma (*Lagerströmia Flos-Reginæ*).

The Review also has some interesting remarks on the natural reproduction due to the flowering of bamboos, which we reproduce.

“The remarks on unaided natural reproduction are generally extremely brief, and I am to suggest that the effect of fire-protection—which has now been continued for a considerable number of years in some of the reserves—on reproduction and the general forest-growth should be studied and noticed in the next Report. In so far, however, as the observations refer to the flowering of bamboos, the reports of the Upper Burma and Pegu Circles have a peculiar interest and importance; for the fact that the reproduction of teak in Burma takes place generally during the periodical flowering of bamboo, which had been accepted on inference and a study of age classes, has now been further verified by observations made during the flowering of *Dendrocalamus Hamiltonii*; and a more general flowering of the larger bamboos will give the Burma foresters the opportunity of assisting nature by introducing a larger percentage of teak into the composition of the natural forest. It is hardly to be expected that much can be effected in the scarcely settled forests of Upper Burma; but the operations now being carried on in the Kôn Bilin reserve, in areas on which the *Tinua* (*Cephalostachyum pergracile*) has flowered, indicate that the forest establishment of the Pegu Circle are alive to the importance of the question.

In the Report on the Tenassarim Circle it is noted that the prices of teak in the home markets varied from £9 to £11-10, the freight varying from 40s to 45s per ten. In Bombay and Calcutta the prices of squares varied from Rs. 50 to Rs. 70 and of scantlings from Rs. 60 to Rs. 90. In the Pegu Circle Report, it is noted that 6,032 tons of timber, other than teak, were exported to a value of Rs. 330,993 most of it being pyinkado sleepers. The total quantity of teak wood exported during the year, from the ports of Rangoon and Moulmein, came to 161,967 tons, valued at Rs. 117,01,664.

The Upper Burma Report is naturally the more interesting of the three and it is clear that progress is both fast and good. It is clear, however, that the forests have long been overworked and will require rest and careful treatment for a long time, for the result of girdling operations shews that of an expected number of 32,000 trees only 20,048 were found.

There is an interesting account of Mr. O'Bryen's deputation to accompany the Maingkhwan column in the exploration of the rubber tracts in the Hukong Valley,

“The column only spent 24 days in the Hukong valley, and, owing to difficulties in the way of supplying rations for his escort.

‘Mr. O’Byren never got nearer than within six days’ march of the largest forests, which are said to be on the hills to the north and north-east of Ntuptumsa at the sources of the Thabyè and Tawan chaungs. After leaving the Hukong valley Mr. O’Byren went to Fort O’Donnell, selecting *en route* a site for an experimental rubber plantation. He then proceeded down the Uyu river as far as Momôn, whence he struck across to Lawsôn near the Indawgyi lake, and thence followed the foot of the hills west of the lake to Kamaing. *Ficus elastica* is reported to extend from the Indawgyi lake in latitude 25° 15’ northwards as far as the Shan States of Kampti on the Irrawaddy and north-west into Assam, but it does not appear to grow east of the Irrawaddy. In the forests examined, the rubber trees were never found in compact blocks, but scattered either singly or in groups in dense evergreen forest, and it was ascertained from the Kachins that all the rubber forests are of a similar description. Countings made in the forests showed a general average of 9 trees per 100 acres, but on the Jade Mines road, from Nanyong to Numnuyang, as many as 50 trees per 100 acres were found. The more accessible forests have been overworked, and many trees have been killed by tapping the underground roots, but it is satisfactory to learn that in some cases the local Sawbwas have realized the fact that trees cannot be drained year after year with impunity and have established a kind of rotation, which gives them a fixed yield every year. A considerable area of the rubber forests appears to be so remote as to be practically unworkable.”

The importance of economizing the Indiarubber trees cannot be over estimated; they are difficult to manage and repay ill treatment by dying off or giving merely a useless watery fluid, instead of the properly congealing kind.

Mr. Oliver’s Report records the flowering of several bamboos during 1891. ‘Wabomyetsangye’ (*Dendocalamus Hamiltonii*), ‘Thanawa’ (*Dendocalamus Oliveri*) and ‘Wapyu’ (*Dendocalamus membranaceus*) were all in flower during the year, as was also *Bambusa Tulda* and a fine species also called ‘Thaikwa’ but quite separate from it. Seeds of most of these were sent to us in Dehra and the result will be, we hope, the successful introduction of several valuable kinds into the Dûn. We cannot too much thank Mr. Oliver for the trouble taken by him and we hope that these will merely be the first instalment of many useful similar introductions. Bamboos are a ‘drug’ in Burma, but in Northern India they are of great value and are probably the most profitable of forest species.

Some interesting experiments were made with the wood of various oaks, as material for beer-barrels. We quote the following remarks of the Conservator of Upper Burma on the subject. “Further specimens of *Quercus glauca*, *Quercus serrata*, and the species called in last year’s report *Quercus semiserrata*, but now believed to be a new species, were supplied to Messrs. E. Dyer

‘and Company of the Burma Brewery for experiment. The casks made from the two former proved useless, as the wood was too porous, and the beer oozed out. The latter species is reported to have good, straight grained wood, free of knots, very nearly resembling imported oak, and the casks made of it retained the beer well. Unfortunately this species is only known to occur over a limited area in the Ingyauk valley, near Bernardmyo, and difficulties in the way of transport render its price prohibitive.’

The financial results of the year for the whole of Burma were :—

Revenue	...	...	...	41,85,414
Expenditure	...	...	...	16,43,598
			Surplus	25,41,816

which shews what a valuable property the Government has in its Burmese Forests.

We will conclude with one more quotation from the Chief Commissioner's Review, which shews that the Pegu Conservator has a great undertaking on his hands. We shall be greatly interested in hearing of the result of these plantation works. The Khair or Cutch tree has always been looked upon as one of the most difficult to manage in respect to reproduction and these plantations cannot fail to add greatly to our knowledge of its habits and requirements.

“The question of the reproduction of cutch received special attention during the year under report. The Conservator of Pegu drew up careful proposals for the formation of a plantation of pure cutch on a considerable scale. These proposals provided for the planting of 700 acres annually for 60 years at an annual cost of some Rs. 22,000. The Inspector-General of Forests having expressed his approval of the Conservator's scheme, sanction was given to it and steps are now being taken to carry it out. Special reference should be made in future reports to the action taken in connection with this scheme.”

Road Arboriculture in the Central Provinces, 1891-92.

When so many reports on various departments contain little but praise on their own work during the year, it is interesting to come across one report which is nothing less than a complete admission of failure. The Commissioner of Settlements and Agriculture regrets, to begin with, that the work of the Local Authorities

in respect to Arboriculture has been by no means satisfactorily carried out and goes on to shew how some District Councils have devoted their energies to "making a profit out of what was intended to be a charge on their resources."

During the year, 12,263 trees were planted, partly on road-sides, partly in groves ; partly by Government, and partly by private agency. The expenditure came to Rs. 10,553, so that each tree planted cost something less than 14 as. But out of the expenditure Rs. 7,270 were on maintenance, which reduces the cost of each new tree to something over 4 annas.

The Chief Commissioner considers it "premature to expect 'any beneficial action on the part of District Councils without the 'guidance of the responsible Officers of Government," and recommends more personal interest in the matter on the part of Commissioners and Deputy Commissioners.

The idea is to encourage malguzars and villagers to plant along road sides, and as soon as the trees are established to grant them sanads so as to secure to them the permanent usufruct. But no plan of this sort will be of any avail unless the District Magistrate, takes a personal interest in the matter, creates nurseries in suitable localities, and sees that the trees are of the right kind and size when put out, and that subsequent maintenance is properly secured. He has to hand in most cases a professional adviser, the District Forest Officer. The services of the latter might surely be enlisted, and another plan would be to institute an Arbor Day, a function which has been attended with great success in America, and in parts of Australia, notably in New South Wales, where in 1891, 100,009 trees and shrubs were planted out by Schools and corporate bodies on a day set apart for the purpose as a general holiday ; and Mr. Ednie Brown writes that he has in one State nursery alone, nearly 200,000 plants ready for the next Arbor Day. We feel convinced that something of this kind could be managed in the C. P., and that if the scheme were carefully worked out, it would result in wider interest being taken in tree-planting, and in more satisfactory avenues. In the next report, we should like to be informed what species of trees are planted, and how they are protected until grown beyond the reach of cattle. The subject is one of the utmost importance for hot countries like the Central Provinces, and one that evidently received considerable attention in earlier days.

A. S.

V.-SHIKAR.

The Other Side of the Question.

It is an evening in the month of May, a hot May and a hot evening. I am perched some fifteen feet from the ground in a "Machan" where I have been sitting motionless for nearly two hours. My whole body is cramped and uncomfortable, the flies which worried me nearly to distraction before sunset, are now quiescent, but their place is taken by thousands of mosquitoes which alight on every available square inch of skin and, when there is no longer standing room, buzz round my head in hungry swarms. The outlook is picturesque. To my right, a forest lake covered in its shallower portions with the huge lotus blossom in full bloom, freckled with islets of flowering narkal grass, bordered by green rushes and reeds, interspersed with patches of open water in which snake birds and moorhens are disporting themselves. On the dead cotton tree by the side of the lake, a couple of ospreys are perched and occasionally utter their discordant cry. Herons arise with outstretched neck and composing themselves for flight, curve back their heads with harsh croaks. As a background, the sal forest, gorgeous in the new foliage of spring and resplendent with white heavy flower. To my left, a patch of tree jungle, an indescribable mixture of foliage, here and there a thick undergrowth of Jaman, an occasional stretch of greensward which would be no disgrace to a country house in England, a siris tree covering the ground with its scented pods, a rohini with the departing glory of its crimson berries. And within fifteen yards of my perch, a dead buffalo, his hindquarters gone, a busy swarm of insects around him and two circumspect vultures in the tree above. The sun has set, all the beauty has gone from the scene, leaving only the disagreeables. The herd of spotted deer which have afforded pleasant remark for the last half hour have vanished, the stillness of the summer night is interrupted only by the distant call of a Sambhar, which is taken promptly as an excuse for crowing by all the neighbouring peacocks; the busy night-jar is noiselessly flitting around and settling, utters his curious note so like a tapping on a plank; the crested fish-owl is heard scolding and hooting on the shadowy trees by the waters' edge. And suddenly, attention is directed to a heavy footstep

through the fallen leaves advancing unhesitatingly and without concealment. It ceases as suddenly as it commenced and every faculty is strained to distinguish in the fast falling gloom, the cause of the footsteps and to interpret the reason of the sudden silence. This silence, however, did not last for long. It was succeeded by a rush and a stifled roar and then, horrible to relate, a voice broke the stillness of the night. It was gruff and angry and uttered these words. What the——are you doing? Leave a fellow alone, can't you? And another voice, powerful but gentle, answered, "My son, I save you from destruction, listen to words of wisdom and then proceed on your way." I turned quietly in the "Machan." Two tigers were dimly visible in the gloom of the starry night. The elder and larger, an immense brute who shewed signs of age, was restraining a younger but full grown animal. I repressed my desire to fire and listened to the conversation which ensued. "Yes, replied the youth, this is all very well but when there is a buffalo in the question, and *my* buffalo too, I would rather have my dinner first and then, safe from interference of yours, listen to the words of wisdom you promise! My son, enjoined the elder, if buffalo was my object, I might have secured it long before you arrived on the scene. I lay and watched it at a distance, I heard your approach, saw the dexterous way in which you dispatched it, and after you had taken your fill, might have made a meal myself were I not at that moment the living sepulchre of a Sambhar stag and therefore uninfluenced by the coarse and skinny prey you had made. I appeal to you, whether or not I might on your arrival here this evening, have despatched you with a single blow had I wished to play back on you in any way? The younger grunted deeply and after a pause ungraciously replied that he was in no hurry for his feed as he had only 12 hours before engulfed half the kill which was the subject of his jealousy. "In that case, replied the senior, listen to the story of my life and then fall to with what appetite you may. I may, he began, claim to be a naturalised British subject, for though my parents were Nipalese, I was never under the munificent government which offers a reward of Rs. 10 for my head. Fortunately, the value of the rupee is now infinitesimal and still decreasing, so that this premium is, like most other matters concerning this coin, merely swagger which does not affect me. My parents left the country of their birth on account of the unsportsmanlike behaviour of its inhabitants. You would hardly believe unless I told you——and here he growled the pronoun——that these wretches have a custom of tracking tigers and surrounding them with one to two hundred elephants. Gradually constricting the circle, they detach shooters, from whom there is absolutely no chance of escape, except to such tigers as are capable of reasoning and keeping their tempers. My parents awoke one morning to find themselves in the toils, but my noble, if somewhat unsympathetic father, made no further remark except to order my mother, under pain of his displeasure, to do exactly as he did. My mother, a rather vain and timid creature

promptly agreed, for she had too often observed that my father's displeasure resulted in severe injury or death to those who incurred it. When, therefore, the ring was complete and the shooters advanced to bag their prey, my parents arose as one man, and, uttering the most frightful roars, charged the circle at the weakest point and got clear away, after inflicting various wounds in the legs of the surrounding elephants. They did not halt in their wild career, till they crossed the river boundary of their native country and lay panting in a jaman grove in British India. And they then and there decided that their native country was not good enough, and that they preferred to pass the rest of their days in a locality where it was utterly impossible to collect 200 or even 50 elephants. Thus it happened that I was born in British India and here, I must remark, that it is a poor country, for in the first place they protect the forests from fire, so that it is almost impossible to catch a deer, unless you have the speed of a greyhound and can course him in the open, and secondly because the jungles are full of forest officers, who if they do not themselves shoot, invite others to do it for them, and to this end train up their servants to notice each foot mark inadvertently left on a sandy path. Still, with these evils ever present, at least you are not surrounded and obliged to fight for your life. A little caution and an escape by flight is always open to you. The three happiest years of my life were spent with my doting parents. I had, during that time, absolutely no cares, food was plentiful and danger did not exist, when two experienced tigers were for ever on the look-out. But one unlucky day, I incurred my father's displeasure. I inadvertently annexed a bone which he had put aside as a tooth pick after a full meal on a spotted stag, and he struck me a blow on the head which was instantly followed by oblivion. When I awoke, I was alone, and soon became aware that I had been left to my own resources. This, however, did not discourage me, for I was well able to provide myself and after an exhaustive survey of the vicinity, I fixed my head quarters in the neighbourhood of a forest bungalow, whence should venison fail me, I could always make a raid on the cattle which grazed around. It was on such an occasion that, late in the afternoon, I had struck down and dragged to cover a large buffalo, but unfortunately the noise of the inevitable scuffle at once attracted the attention of the owner, who rushing off to the Forest House, gave news to the Europeans there. In a very short time three or four men arrived and surveyed my prize, and though I prevented them by incessantly growling, from removing the buffalo, they nevertheless insisted in climbing a neighbouring tree, where they remained for some time for some inexplicable reason. Towards nightfall, however, they came down from their perch and walked hurriedly away, whilst faint with hunger, I advanced to the kill, determined to make a hearty meal. No sooner had I reached the carcase, when I felt a blow in my side, which threw me off my balance and in the same instant a loud explosion rent the air. I lay groaning

with rage and pain, filled with an indescribable longing to tear something to pieces, and waited till some sound should disclose my enemy. It seemed ages before I heard a slight noise in that fatal tree and a voice softly whispered "he is now dead, let us get out of *this* ! a remark which was instantly followed by a loud shout and the approaching footsteps of an elephant. The whole treachery of man was now apparent to me and I recognized that I had been, perhaps, mortally wounded by some miserable wretches who, seated far out of reach, had shot me as soon as I approached the kill. In the confusion and bustle which followed the arrival of the elephant, I staggered a short distance away and congratulated myself when I saw the sportsmen depart promising to bring in my corpse in the morning. At that time, however, I was miles away. First dragging my aching body to the nearest pool I cooled my wound and stopped the bleeding by rolling on its clayey banks and then, leaving no bloody trail, I slowly reached the gloomy recesses of the great tree jungle and rested, determined to sell my life dearly if further pursued. For weeks I hung between life and death, reduced to a skeleton by the pain of my wound and the constant pangs of hunger. I roamed, the ghost of my former self, through my old haunts, forced to exist on all kinds of food I once despised, since I had no strength to kill deer or cattle. It was not till the following winter, that I took a turn for the better and became myself once more but changed from a careless frolicking young tiger, to a circumspect and experienced animal who knew that length of life depended on self restraint and caution. The narrator here paused and the younger tiger gave vent to a sigh of impatience. "Perhaps, he said, to his companion, when you have got your breath again, you will tell me why this wearisome tale is inflicted on me ? The other appeared somewhat vexed at the discourteous speech but quietly answered, "Because, my friend, there is a human being armed with several guns in that jaman tree just over your buffalo and though I am screened from his fire by this tree trunk, you are full in view." The younger tiger with one frantic bound sheltered himself behind his cynical friend and after a while breathlessly exclaimed "I don't believe a word of it, I can see nothing." With a low chuckle, the other gave answer "Had you not believed what I said, why show such agility in changing your position and if you still disbelieve, why not walk up and see how your buffalo is getting on." The junior made no reply and the old tiger went on. "I have lived to a good old age and know every device that can be brought against me by man, and yet I also know that some day I shall fall a victim to my own carelessness or neglect; it was to save your life I have spent the best part of a hot evening here, not because I admire you or your temper, but because we shall soon disappear as a race unless young fools will learn to profit by the experience of their elders. The story of my life you will not let me complete but I have a few more remarks

to make and they shall be to the point. Always keep near your kill ; if it is visited by man, desert it at once and for ever. Never wait for the near approach of an elephant ; however unpleasant it may be, always retire as soon as you hear one in the vicinity. Do not annoy human beings, you will be classified as a dangerous pest and your destruction is certain. Finally, cultivate a more courteous disposition and take well-meant advice in the spirit it is offered. With that he arose and instantly disappeared in the neighbouring grass. The younger tiger muttering something about "old fool" and "dotage" slunk cautiously away and was lost to sight amongst the gloomy trees. Meanwhile I, the occupant of the "Machan," got entranced at this marvellous occurrence and thankful that I was safe up a tree, composed myself to pass the few remaining hours of darkness. I awoke when the earliest dawn was faintly visible over the distant forest and my first glance was for the buffalo. It was gone ! This then, said I to myself, is the result of sleeping at your post and dreaming idle dreams when you should have been on the watch. I looked cautiously around and guided by a sound suggestive of bone crushing, made out dimly, in the feeble light, a group at about 40 yards' distance. It was indistinct and blurred, but the fast-coming day made it every moment clearer, and as the morning sun topped the highest trees and shone over the lake, raising little wreaths of mist from its shiny depths, it shone also on a fine young male tiger who arose from the scattered remains of the dead buffalo to greet the commencement of a new day. After all the serious talk of last night, I murmured, so much was my brain still confused with facts and visions, after all those solemn warnings, the brute has yet risked life for greed. And forthwith a cloud of smoke was belched from my leafy recess and the forests rang and re-echoed with the sharp report. The air was full of the alarm notes of forest birds and animals thus rudely startled, whilst two quick short roars to my right and the hasty movement in the heavy grass there, told me that another tiger must have been witness of the scene just enacted. I waited for him to break in the open and so gain his forest retreat but in this I was disappointed, for after a lapse of several minutes, I saw him slowly and majestically stalk out of the deep grass some 300 yards off and walk up the steep bank into the Sál forest whilst the convulsive twitch of his tail, as he disappeared, intimated that he was silently chuckling at having disappointed a sportsman for the hundredth time. As for his companion, on the shot being fired which had struck him full on the chest, he had reared straight up on his hind legs and beating the air furiously with his paws had fallen dead amongst the *débris* of his repast.

VI.-EXTRACTS, NOTES AND QUERIES.

The Sanitary Effects of Woodlands.

For us to realise the effects of woodlands upon public health we must first notice the conditions found in a wooded country, and the changes that happen, as it becomes cleared. From this we may, to some extent, retrace the process that takes place, when a region, wholly cleared and rendered insalubrious in some countries by the malaria that has been produced by the change, is restored by due and proper planting to its former healthy state.

A country wholly covered with forest is undoubtedly cold and humid in temperate climates; it is often infested with deadly fevers in the torrid zone. The climate of ancient Gaul must have been very different in the days of Julius Cæsar from that of France as it is to-day.

It is not unusual to notice the occurrence of intermittent fevers as a wooded country first comes to be cleared up and brought under cultivation. The "Genesee Country," and the level and somewhat swampy lands of some parts of Ohio, and other Western States, gave them a very bad reputation in the early days of settlement. A man who owned a farm on the site of Cleveland, about 1818, has told the writer that he would not have stayed in that region if the whole of it had been given to him. But the most or all of these sickly regions of an early day have long since not only regained their credit, but are now regarded as quite salubrious throughout the year. The decaying wood and other vegetation which, when first turned up by the plough, loaded the atmosphere with unwholesome vapours, has long since wholly decayed, and swamps have been drained; stagnant waters no longer dry away under a hot summer sun, the causes of this sickness no longer exist.

In some countries, as in Italy, excessive and persistent insalubrity has been brought on not by the clearing of woodlands, but by another process. As the forests upon the mountains were cut away, the soil becomes exposed to torrents, and great quantities of material were washed into the valleys. The coarsest and heaviest part was left in the intervals, often rendering them sterile and uninhabitable; the finest part was carried down toward the mouths of the rivers, which they choked up, closing their channels to commerce, and causing lagoons. These have rendered a once healthy and densely-populated country in some parts almost uninhabitable. The

"Maremma" of Tuscany, along the coast between Leghorn and Civita Vecchia, and the "Campagna" around Rome, are examples of this change. The Government has done much towards improving the former, by drainage, and by dykes for preventing the mingling of fresh and salt water; and an enterprising corporation, under the patronage of Government, has made a splendid beginning in the latter, of which we will now speak.

The Abbey of Tre-Fontane, but three miles south of Rome, was built on the spot where, according to tradition, St. Paul was beheaded, and for many centuries was regarded as in a healthy region. It is a gently rolling country, wholly devoid of trees, fertile enough for cultivation, but for a long time so sickly that the place was given up for habitation, and came to be called "the tomb." Mrs. Jameson, in her book entitled "Sacred and Legendary Art," thus describes it:

"In all the melancholy vicinity of Rome there is not a more melancholy spot than the Tre-Fontane. A splendid monastery, rich with the offerings of all Christendom, once existed there; the ravages of that mysterious scourge of the Campagna, the malaria, have rendered it a desert. Three ancient churches and some ruins still exist, and a few pale monks wander about the swampy, dismal confines in which they stand. In winter you approach them through a quagmire; in summer you dare not breathe in their pestilential vicinity; and yet there is a sort of dead beauty about the place, something hallowed as well as sad, which seizes upon the fancy. . . . The ancient frescoes have perished, and the modern ones are perishing. It is a melancholy spot."

The reputation that the eucalyptus had gained as a disinfectant in malarious regions suggested the thought of trying it here. This tree, a native of Australia, grows in its native country to a vast size, even outmeasuring the giant trees of California in height, and, in favourable conditions, growing with great rapidity. Of nearly a hundred and forty species, there is not one that will endure the cold when planted elsewhere than in its native climate, although some of them there will endure a considerable degree of cold. The difference is probably due to the more thorough ripening of the wood by the warm dry summers that precede their winters. In some parts of California it grows as luxuriantly as at home: but the hot days and cold nights that sometimes occur in winter along the gulf coast prove too much for it, even through it is scarcely cold enough to freeze. In Algeria and other warm countries, it thrives wonderfully well, and the success that had attended its cultivation there led to its trial near Rome. Probably religious zeal had something to do with it, as at least worth trying in order to rescue a place that was sacred in the eyes of devout Catholics.

A brotherhood of French Trappist monks undertook the task about twenty years ago, getting three acres planted around the monastery. At first they returned to the city to sleep, but about a

dozen of the number died. The beneficial effects, however, began to appear as the trees grew, and in 1874 they ventured to sleep upon the premises. Some of them after this were taken sick, but the disease was of a mild form, and it has steadily been growing less from year to year.

In September, 1879, an agricultural company was formed by them, and a lease obtained upon easy terms, one of the conditions being that they shall plant a certain number of eucalyptus trees every year until the whole tract (494 hectares, or 1,223 acres) is under cultivation. They hire convicts from the city prison, who are paid about 20 cents a day, but not till the end of their term. The selection was made from those sentenced to ten years or more, and who had served out more than half their time. When the writer visited the place in October, 1881, there were about 150 of these men at work, and they had been planting all summer long. The trees are started in boxes, and are set without disturbing the roots. They are well watered at first, and for a year or two afterwards, and the trees are set wide apart so as to admit of cultivation of vines and grain between. There had been planted about eighty acres that season, and since then the number of labourers has been largely increased. In 1881, for the first time, the convicts were lodged upon the premises, and no inconvenience was observed. The rapidity of growth of the trees is remarkable, and, although there had been frosts that killed back the new sprouts, they budded from the older wood a little lower down, and soon recovered from the injury.

Although we cannot plant eucalyptus trees to much extent in the United States, we can at least plant other kinds that produce the most beneficial results on the public health. Whether, in that case, it be the vast amount of drainage that they secure in a spongy and retentive soil, through the evaporation from the leaves, or whether there be some specific quality in the aromatic emanations, something like what we perceive in a pine wood, is not fully known. But it has been sufficiently proved that a belt of woodland will intercept or absorb the malaria of a marshy region, whatever may be the species of which it is composed.

There can be no doubt but that the coolness and freshness imparted to the atmosphere by a grove of trees in summer is conducive to health; and that to have parks and plantations in cities and upon private grounds is as salubrious as it is agreeable to the senses and tranquillizing to the mind.

It is only in recent years that our city authorities have begun to appreciate the importance of parks, and to notice the opportunities offered by a wild, rocky suburb, a neglected and barren common, a river bank, a shore, an island, or a point of land which, at a small cost, may be turned into a paradise of beauty, a health resort to the citizens, and an inviting place of rest. In planting trees round a dwelling, it should be remembered that fresh air and sunshine are essential to health, and that for this reason they

should not stand too near nor too close. It will also be found that some trees, like the alanthus, emit a nauseating odour in blossom, and that a judicious choice of kinds will greatly affect the result of growth. It would not be worth while to spend time and money in planting the chestnut in a limestone soil, or the oak or maple in a light sand, or the pine in a heavy clay soil. By carefully observing the conditions in which the native trees thrive best, we can infer what is best for them. But where exposed to the dust and smoke of cities, our choice must be limited to a smaller number.

But in summing up the results, omitting altogether the commercial values of wood, we find ourselves largely indebted to the groves and woodlands for an infinite amount of human happiness. In all time since man, according to Scripture, was first placed in a garden abounding in all manner of trees, bearing goodly fruit, down to the present time, we find them in one way or another ministering to his comfort and his health. In youth we hail the approach of spring, with its expanding foliage and the opening blossoms of the trees, as the gladdest season of the year. It is the symbol of hope, and the promise of happiness to come.

In middle life, when worn down with the cares of business, with mental labour, or with physical toil, we find no remedy so grateful as the summer shade and the quite rest of a woodland retreat. It is health-inspiring and renovating to an incomparable degree, and is often prescribed by skilful physicians where other remedies would fail.

As the season advances, we find a fitting symbol of the approach of age in the ripening fruits and the golden hues of the declining years. Let us, then, provide refreshing groves within easy distance from the homes of our labouring poor, in our cities and villages, and such as have opportunity, upon the grounds around our dwellings.

If we would realise the luxury of these surroundings, we have but to imagine what life would be without them. If there be a term in language that expresses everything that is desolate and dismal, it is that of "*a treeless waste.*"—(*Franklin B. Hough in Timber Trades Journal*). .

Paper From Timber.

In none of the mechanical arts has greater progress been made in recent years than in the manufacture of book and magazine paper, many tons of which are used every month. Years ago, though not too long to endure in the memory of "the trade," the process of converting the raw material into the hard-fibred and smooth-surfaced paper essential to the needs of the higher class publishing houses, was a task involving many days of constant care and much manual labor. To-day the progress

is extremely rapid, the paper is infinitely better, and much of the manual labor that was employed in the days of our fathers has been supplanted by labyrinths of swift moving machinery.

It would be difficult to imagine, says the *Manufacturer and Builder*, a more surprising metamorphosis than that by which the native timber of the Pennsylvania hills is converted, in seven hours, to a sheet of clear white paper ready for the press. Yet this, in brief, is the process that is going on every day at the New York and Pennsylvania Co's mill at Johnsonburg, in Western Pennsylvania. This mill is the largest paper making establishment in the world. It covers several acres of ground, and almost as many acres of machinery. Sixty cords of wood are thrust into the choppers and 90,000 pounds of paper are shipped from the yards every day to be cut, printed, and placed on countless libraries throughout the land.

The chopper, where the conversion of wood into paper begins, is a short guillotine. There is a sharp blade, of massive proportions, moving swiftly in a groove. Everything that comes beneath the knife is severed. Occasionally, a tough knot that has withstood the blasts of many a winter is tossed in, only to suffer the fate of the sapling that went before. Every stick that goes in comes out in the shape of chips no larger than the palm of a man's hand. The wood does not lose its identity, however, until the next stage in the process, which is known as "cooking." There are several large digesters, containing caustic soda, in which the chopped wood is placed and cooked for five hours, this being the longest single process to which it is subjected. From the digesters it is blown into a large tank, its consistency being thick and heavy, and the color an ugly brown.

The soda having been run out, the pulpy cooked wood in the tank is washed down with hot water and thoroughly cleaned. Then it is dumped into a large chest, cleaned again, and, having been pumped into a screen which removes splinters and *débris*, it is run into wet machines and in a measure dried. The "stock" emerges from these machines an unbroken sheet of light brown pulp, resembling soaked birch bark. As it falls from the machines it is taken on, carried to four bleachers, each holding 4,000 pounds. Here it is treated with chloride of lime liquors until the desired whiteness is obtained.

By this time one begins to see how it is possible to make paper from wood, for the "stock" has already assumed a beautiful white color, and its consistency is of a soft pulpy sort, very much like boiled starch, and not at all like wood. Squeezed in the hand, however, there remains a dense fibre that clearly shows the stuff of which paper is made, and establishes the link that binds the pulp in the tank to its parent timber on the neighbouring hills.

A pulsometer pump close by the bleachers, next drives the white mass into fifteen large store chests, each holding 8,000 pounds. It is held in the chests, until the beating engines are ready to give

it a shaking up preparatory to its final transition. The stock, which is now called "half stock," receives its coloring material and sizing. If blue, yellow, pink, or any other color is desired, this is the stage in the process where the coloring material is supplied. The "sizing," which consists of resin and an alkali boiled together, is used to give the paper the desired resistance to atmospheric influence. An alum is used, which separates the alkali from the resin in minute particles, and while passing through the callenders or the paper machines it fuses, thereby completely covering the sheet with a film, which effectually resists the influences of the atmosphere. Clays are used to make the paper opaque.

From the beaters the "half stock" is passed into a large chest holding 4,000 pounds, containing an agitator turning at the rate of twelve revolutions a minute and thus keeping the stock in a uniform condition preparatory to its passage to the refining engines. These engines, two in number, supply 106 inch paper machines, which marks the beginning of the metamorphosis. Having passed through a sand catcher to a receiver or mixing box, the stock finds its way to the great Fourdrinier machines. Still in a liquid state, it is passed to an endless wire screen and a vibrator where the water is then taken from the partially formed paper by means of three suction pumps. This screen contains seventy meshes to the square inch, and is forty feet long. By the time the stock leaves the screen, its transition to the paper state is clearly defined, though there is still a long line of humming machinery through which it has to pass. The primary stages, however, are over.

A ten-inch "dandy" roller now gives the paper the same shape and surface on both sides, and, if necessary, supplies it with the water mark. Then it passes to two couch rolls covered with woollen jackets, and then to a thirty-two foot endless Bredt wet felt, where the remaining water is pretty effectually pressed out. As there is some water remaining, another felt press is resorted to, and then the paper is ready for the drying cylinders, fifteen of which, each 48 inches in diameter and heated by steam, relieve the paper of the last of its moisture. A cloud of steam rising from these cylinders as they slowly revolve with their white coverings shows that some moisture still remains. But the cloud grows less and less dense as the last of the cylinders is reached, and by the time the paper reaches the callenders it is as dry as a bone. These callenders are chilled iron rollers, which give the paper its desired finish. From these it passes to six revolving reels, and then to the cutting machines, where it is cut in any shape or size preparatory to shipment. While this interesting process is going on, the caustic soda used in cooking the wood originally is by no means forgotten. The soda is somewhat expensive, and about 65,000 pounds of it would be lost every day, if it was not recovered. Accordingly it is drained through the bottom of the tanks, to be subjected to a remarkable series of processes which eventually restore it to its original condition and to 90 per cent of its original volume.—(*Indian Agriculturist*.)

World's Fair Notes.

India has sent one of the most charming collections of woods it has ever been the pleasure of any one to see. These are being polished and prepared for the space allotted to that country. New South Wales has a very large and charming collection of woods rich and rare, these are being polished and put in place, as are also the alleged to be un-wear-out-able paving blocks from Australia; but the States of Illinois and Nebraska are the first on the grounds with elaborate collections of native woods, and if any one supposes that walnut finish is a lost art, he need only to look at some of the mammoth specimens of walnut from the State of Nebraska and to see the beautiful, polished specimens of the same wood and others, and he will change his mind very quickly. California's red wood, cedar, and other specimens are entirely worthy of the forests of the Pacific Coast, and many other specimens from foreign and domestic States are expected very shortly.

ENGLISH OAK FOR THE CHICAGO EXHIBITION.—Messrs. Hampton & Sons, of Pall Mall East, and Cockspur Street, London, have prepared some remarkable work for the Chicago Exhibition. By permission of Lord Salisbury, they have made a facsimile of the historic banqueting hall at Hatfield House, and are thus able to send to the New World an unique specimen of English art as it was in the sixteenth century. Some idea of the labour involved may be inferred when it is said that the reproduction is 44 ft by 22 ft., and lofty in proportion, that it is constructed, internally, of oak alone, and that almost every inch is covered with work. In proceeding to carry out their design, Messrs. Hampton sent down a staff of artists, who took casts of the fantastically carved figures, and made drawings of all the panels and traceries, and these have now all been faithfully reproduced. With the exception that the new hall is slightly smaller than the original, the Americans will be able to see an exact representation of a famous hall in one of the most historic of English houses.

CEYLON.—Ceylon will make an unique exhibit at the World's Fair. The floor of the building it will erect will consist of Ceylon woods. The pillars, capitals, and carvings will all be reproductions of original objects in the ancient cities of Ceylon, and these will all be worked in ironwood, ebony, and satinwood. The gradations of colouring in the carved pillars will be striking. The shading is from the pale crimson yellow of satinwood to the warm orange brown of the jakwood and the darker tints of margosa, palm, and Kumbuk and old root-stem wood of the tamarind are beautiful in their markings. Abundance of light to reveal the beauties of carvings and traceries in the building is to be secured by a large number of windows with beautifully-carved frames. One of these window-frames will be a reproduction of the stone window from the palace at Yarahu. The building is to cost about 20 000 dolrs — *Timber Trades Journal*.

Notes on the Climatic Influence of Forests.

While writers on forestry and friends of the Forestry movement have been advocating reform in the public treatment of forests on the ground of their conjectured climatic importance, a thorough investigation of the question by scientific methods and careful systematic measurements has been made in Europe, where well established Forest Administrations rendered possible such work on an extensive scale—such a scale as is necessary for conclusive results.

The question of practical importance is not so much as to the effects of the forest upon the general climate, but as to the local modification of climatic conditions produced thereby. We are not concerned as to whether the total rainfall over the continent is increased, but whether the distribution of precipitation in time and quantity over and near a forest area is influenced by its existence; whether we or our crops feel its absence or presence in our immediate neighbourhood.

We can readily understand that an effect upon climate, if any, must be due, in the first place, to the mechanical obstruction which the forest cover presents to the passage of air currents and to the action of the sun's rays upon the soil; that it must result from a difference in insolation and consequent differences in temperature and evaporation over forest and field; and that this influence can become appreciable only when large enough air columns of different characters are opposed to each other, capable of producing local currents of air which may intercommunicate the characteristics of one area to the other, or else of changing the character of passing air currents. The size and character of the forest-growth, its density, height, situation and composition are much more important in determining its influence than has been hitherto supposed. It is not trees but masses of foliage, which may be effective.

The most important contributions toward a solution of the question of climatic forest influences are the observations at three sets of forest meteorological stations, established in Switzerland, Germany and Austria. The systems, made up of double stations,* one within, the other without, the forest, but under similar conditions, otherwise cannot finally decide the question of the climatic influence of the forest, but they may furnish preliminary data in establishing the differences between meteorological conditions in the Forest and in the open, from which finally the reaction of one upon the other may be deduced with the aid of additional observations in radial stations, such as have been more recently established in Austria.

The observations in the forest meteorological stations of the Canton Berne, lately published, comprise nineteen years at three sets of stations, the largest systematic series of observations so far

recorded. Only the temperature observations of air, soil and tree-interior are so far published with results which permit of the following conclusions. The air temperatures taken three metres above ground are found in the forest lower for mean annual as well as mean monthly, except during winter months. The difference is greater at 4 p. m. (time of daily maximum) than at 9 a. m., and increases as the season temperature increases, reaching its maximum in July, then decreasing toward fall; in winter the air temperature in the woods is nearly the same as in the open, or, at least, only slightly warmer. The evergreen forest seems to exert greater cooling influence than the Beech-woods. Altogether, the range of temperatures through the year is from two and a half to three degrees, Fahrenheit, greater in the open.

The soil surface in the open in Summer is warmer, in winter colder than the air; in the forest, on the contrary, the surface temperature is always lower than the air temperature, and the forest-soil shows at all depths during spring, summer and autumn lower temperatures, but in winter either the same or slightly warmer than the open. The greatest difference is found at the surface, the Spruce forest at Berne exhibiting the greatest cooling effect to the extent of nine degrees Fahrenheit while the warming effect in winter ranges only from one to two degrees.

At 9 a. m. no difference was found between temperatures breast-high and in the crown of the trees, but at 4 o'clock the crown shows higher temperature, except in winter, when it is as cold as, or colder than, the lower parts. The trees are always colder than the surrounding air and colder than the air in the open especially in summer. This may be one of the factors which help to cool the air temperature in the forest and possibly induce condensation of moisture-laden air currents. The range of tree temperatures is smaller than that of air temperatures.

From the observations at the German Stations sixteen in number, which extend through now eighteen years, the most interesting result regarding forest influence upon rainfall, may be cited at the station of Lintzel. This station is situated in the great Lueneburg heath, a prairie-like country, which during the existence of the stations, has been reforested, so that on, an area of twenty-five square miles the following change took place:—

	BEFORE REFORESTATION.			AFTER REFORESTATION.	
Field and meadow,	12	per cent.	...	10	per cent.
Heath	85	"	...	10	"
Forest	3	" (old)	...	80	"

The reforestation took place at the rate of 1,000 to 1,500 acres a year at first, afterwards more slowly, until 8,000 acres were under forest.

Comparing the rainfall observations with those from stations outside the forest conditions, but near enough to be available for

comparison, the following changes took place at Lintzel. While at first the rainfall was only about eighty per cent of that at the other stations, it increased as follows :—

1882.	1883.	1884.	1885.	1886.	1887.	1888.
81·3	86·3	95·2	99·8	100·6	103·7	103·9

So that finally it rose from a deficiency of nearly twenty per cent. to an excess of nearly four per cent.

The observations at the Austrian Stations cover a period of eight years. These stations, of which there are three sets, are radial, that is to say, there are several sets of instruments in the open at varying distances and in different directions from the forest, by which arrangement, it is to be hoped, not only the difference of meteorological conditions, but also the influence, if any, of forest areas may be determined. These observations are especially valuable, because they have been taken at various heights above the soil, and, therefore, indicate the differences in vertical distribution of these meteorological factors of temperature and moisture. Comparing the air temperatures of forest and field at the same height above, the soil, namely at sixteen, thirty-six and forty-eight feet, we find in the day time the same temperature, lower below, higher above the crowns than at corresponding heights in the open, while in the night, the temperature in and above the crowns is lower. Yet the differences are not very great.

The absolute humidity is always greater in and above the forest. This excess is smallest towards morning and reaches its maximum at noon, then decreases again. The difference at noon is 0·55—0·63 inches, with calm air. The relative humidity at all heights and at all times is higher in the forest, the difference in calm weather at sixteen feet reaching as high as thirteen to thirteen and a half per cent. in the mean of observations. At forty-eight feet it is less, yet in the hours towards morning it is still ten and nine-tenths per cent greater than over the open. In regard to the humidity of the air, it is noteworthy that in the forest the relative humidity increases and decreases at the same time with the absolute humidity, while usually in the field they have opposite progressions. This leads to the conclusion that the forest is at the same time a source of atmospheric water-supply and of cooling. Since on the open the water-supplies under the influence of higher temperatures and unchecked winds, are more readily exhausted or reduced to a minimum where evaporation and transpiration of the soil covering plants does not increase proportionally to temperature increase, it becomes evident that the forest retains for a longer time a water-supply which is easily available.

The observation that both absolute and relative humidity are increased in the forest is a new and important fact, which had not been apparent from the observations of the German Stations situated under the influence of an oceanic (the Baltic and Atlantic) climate, which is characterized by high relative humidity and only

occasional high temperatures, while the Austrian stations are situated near the region of the pontic dry climate. In such a climate the dry air is capable of taking up additional water-supplies from the forest, and since the latter has also a cooling effect, both absolute and relative humidity of air currents passing it are increased, while in the oceanic climate the absolute moisture, already high, cannot be increased, and only the cooling effect of the forest affects the relative humidity. This important difference in general climatic conditions must be kept in view when discussing forest influences. In comparing forest and open field, the kind of cover of the latter must also be taken into account. During the early development of meadow-growth and of crops, while they are green they furnish by transpiration more water to the air than the forest. Since, therefore, during this season the open soil loses both by evaporation and transpiration more water than the shaded forest soil, the latter is able to supply moisture when that of the field soil is exhausted and begins to absorb moisture from the atmosphere, especially when, with the ripening of the crops, the plants cease to transpire much water. Hence, the difference of absolute humidity appears greater in the forest, especially in dry seasons.

The decrease in absolute humidity above the forest crown must, of course, take place at about the same ratio as above the field, but altogether the observations seem to show that the enriching of the air with moisture above a forest cover can extend to a considerable height. These conditions of moisture and temperature above the forest, lend countenance to the claim that the possibility of precipitation over large and dense forest areas is greater than over open fields.

As far as temperature and moisture conditions of forest areas may be communicated to adjoining fields, further light is promised from the radial stations in Austria. The results from these have only just been published, and I will refer to them at some other time. Theoretically, there are various objections to the assumption that the influence, if any, is an appreciable one. But we know that meteorological theories, more than others, are liable to be at fault and unsatisfactory in many respects, probably on account not only of the complicated nature of the phenomena with which they deal, but also of the defects in methods and means by which the data have, so far, been collected.

It is hardly a conclusion, but at least an impression, that seems to come from looking at results already presented that, as a climatic factor, the forest of the plain is apparently of more importance than the mountain forest, the more potent meteorological influences of the mountain elevation obscuring and reducing in significance the influence of their cover, while for soil and water conditions the mountain forest is of considerable importance.

(B. E. FERNOW, in "*Garden and Forest.*")

Death of Monsieur Puton.

We greatly regret to announce to our readers the death on May 13th, from heart disease of Monsieur Puton, C. I. E., Director of the National Forest School at Nancy. One of our brother Forest Officers, Mr. H. J. A. Porter, who happened to be in Nancy at the time and who represented the Indian Forest Department at the funeral service in the Cathedral at Nancy, has kindly sent us the local papers from which we gather that the ceremony was a most imposing one and was attended by the principal Forest Officers, the Prefect and others, the usual oration being pronounced by M. Demontzey, Administrator. We feel sure that all old Nancy students will hear with regret of the loss which our French comrades have sustained. In a letter to ourselves not long ago, Mr. Puton, speaking of his age and failing health, seemed to foretell that his end was not far off, but all the same the news has come suddenly and we are very sorry to receive it.

Alfred Puton was born at Remiremont on March 22nd, 1832; he entered the Forest School in 1851 and passed out second of his year. His active appointments were nearly all in his Native Vosges and in 1868 he was transferred to Nancy as Assistant Professor of Forest Law. He became Professor in 1874 and Director in 1880. He was buried at his native place, Remiremont. His memory will long be kept alive through his many valuable works on Forestry and Forest Law, and Indian Forest Officers who knew him will long remember the interest he always took in 'Les Anglais' and his kindness to them when they visited the old school.

VII.—TIMBER AND PRODUCE TRADE.

Churchill and Sim's Circular

MAY, 4th 1893.

EAST INDIA TEAK.—The deliveries for the first four months of the year have been 3,863 loads against 3,368 loads and 5,360 loads for the corresponding periods of 1892 and 1891. For April alone the comparison is 1,092 loads in 1893, 405 loads in 1892, and 778 loads in 1891. The consumption has shown a welcome improvement in the last two months; prices are stationary, but should not long remain so if this demand continues.

ROSEWOOD.—Prices are fairly steady but demand quiet.

SATINWOOD.—Large and finely figured *logs* realize good prices and there is no unsold stock, but *planks* and *boards* are not wanted.

EBONY.—The demand continues very dull, stocks ample and sales very difficult.

PRICE CURRENT.

Indian Teak	per load	£9	to	£15
Satinwood	per ton	£5	to	£12
Rosewood	„	£5	to	£9
Ebony	„	£5	to	£7

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A tour in Jaunsar.

Every year, in the months of April and May, the students of the Imperial Forest School, Dehra Dûn, are taken on tour through the forests of the Jaunsar Division in the School Circle, which comprises the Reserved Forests in the Government Estate of Jaunsar and the Leased Forests in part of Tehri-Garhwal. There are many matters of great interest to be seen in these forests ; in Forestry there is the natural reproduction of deodar, blue pine, long-leaved pine and oak, as well as the artificial reproduction of all these trees and especially deodar, also the working of the forests under their working plans framed by Mr. N. Hearle, Deputy Conservator of Forests ; in Forest Engineering there are hill roads and the works connected with them, the timber sledge roads of Thadiar, Deota and Bamsu, suspension and girder bridges, river-training works, &c. ; while the Botany of the tour which occurs at the time when most of the chief trees and shrubs are in flower, is most interesting.

For several years, it has been the custom to prepare journals of these tours and in this way the following have been printed and published at various times and some them are still available at the School.

For 1885 prepared by Mr. W. R. Fisher.

„ 1886 „ „ „ A. F. Broun.

„ 1887 „ „ „ W. R. Fisher.

„ 1888 „ „ „ A. Smythies.

„ 1891 „ „ „ C. G. Rogers.

while that for 1892 is in manuscript prepared by Baboo Upendranath Kanjilal. It is unfortunate that those for 1889 and 1890 were omitted. In the following notes which Mr. A. Smythies has put together, much of the information contained in these various journals has been incorporated with observations made during the tour of 1893 ; and as it is believed that the account of the works visited is likely to be of interest to readers of the Forester we have decided to publish them in our pages.

HONY. EDITOR.

FORESTS NEAR CHAKRATA : April 12 to 18.

Roll call at Morrow's Neck at 8 a. m. In the afternoon we inspected the Fuel and Timber sheds in the Dépôt. The old Fuel shed is 146 ft. long and 40 ft. wide. It is entirely built of wood, the original cost being Rs. 5,000, exclusive of the price of the timber. It is divided into 7 compartments, each 20 ft. long. The stack of fuel at the outside near the wall is 8 ft. high. The next is 10 ft. the next $11\frac{1}{2}$ ft., the next 14 ft., and the next 16 ft. There are 5 stacks in the middle, each 18 ft. high, and a similar descending series on the other side. Each stack is 20 ft. long and 2 ft. wide. Thus the contents of a compartment

$$= 2 \times 20 \left\{ 2(8 + 10 + 11\frac{1}{2} + 14 + 16) + 5 \times 18 \right\} \\ = 8,360 \text{ st. cu. ft.}$$

Therefore the contents of the whole shed

$$= 7 \times 8,360 = 58,520 \text{ st. cu. ft.}$$

Oak and fir are stacked separately, and the fuel is issued to the Commissariat Department by measurement, not by weight. There are many reasons for this. First of all, the weight of fuel is never constant; it may be green when it comes in from the forest, and it dries slowly in the shed; but during the rains, it is quite possible that it absorbs moisture to the extent of 15 or 20 per cent of its dry weight and loses it again during the next dry season. Moreover, it would be almost impossible to weigh out such a large quantity of fuel as the Commissariat requires which amounts to 140,000 st. c. ft. every year.

The connection between measurement and weight of Chakrata fuel has been found out by experiments, and stands thus:—

230 st. c. ft. of oak fuel weigh	100 maunds
320 " " fir " "	100 " "

It has been further ascertained that for this kind of fuel, 100 st. cu. ft. are equivalent to 66 solid cubic ft. The present selling price to the Commissariat is Rs. 17 per 100 st. cu. ft. of fir and Rs. 25 per 100 st. cu. ft. of oak.

A small fuel shed has been built to contain fuel sold to the general public, and to keep it dry during winter and the rains. The stacks in this shed contain 50 cu. ft. each and they are sold at Rs. $5\frac{1}{8}$ each. Besides this there are faggots of Indigofera and other woody shrubs, 2 ft. long and 2 ft. in diameter which are sold at 3 annas a bundle.

The Parade Ground Fuel Shed. This fuel shed is similar in construction to the one at the dépôt and the pitch of the roof is $42^{\circ} 30'$. We saw fuel from the Korwa and Kalsi coppices being stacked in this shed. The Kalsi fuel consists chiefly of sal, saip, bakli, dhaura, kusam, baldi, jamun, raini and amaltas. Jhingan, kharpat and other inferior kinds are not brought to Chakrata, but are converted into charcoal on the spot. In connection with the shed is a dry shoot about 50 ft. long with a slope of 34° . Carts

are unloaded at the head of the shoot and the fuel is shot down. The following are the rates for Kalsi fuel:—

Felling, cutting up and stacking ...	Rs.	2	0	per 100 st. c. ft.
Carriage to roadside	"	0	8	" "
" to Chakrata	"	15	12	" "
Stacking in shed	"	0	3	" "

Total Expenditure Rs.	18	7	" "
Selling rate	25	0	" "

Therefore profit. " 6 9 " "

From the Korwa coppice only oak fuel is brought to Chakrata, the rhododendron and ayar being sold to the Brewery. The following are the rates for the Korwa fuel:—

Felling, cutting up and stacking ...	Rs.	2	0	per 100 st. c. ft.
Carriage by mules	"	10	14	" "
Stacking in shed	"	0	3	" "

Total Expenditure Rs.	12	7	" "
Selling rate	27	0	" "

Therefore profit " 14 9

but Korwa is only 8 miles away, while Kalsi is 26.

The Timber Shed at the Dépôt.—This is a wooden building with two storeys, and timber of the same description and scantling is, as far as possible, stacked in one place. In the lower storey there is a frame work supported on posts on which all the timber is placed, nothing being put on the ground. There are scantlings and planks of deodar and fir of nearly 180 different sizes, besides odds-and-ends of miscellaneous species. As an exercise, the students were told off in sections and counted the whole of the stock. First class deodar scantlings are sold to the Executive Engineer, Military Works, at Rs. 1-12 per cubic ft.; second class pieces are sold at Rs. 1-6 per cubic ft, generally to private persons. First and second class planks sell at Rs. 1-8 and Rs. 1-4 per cubic ft. respectively.

The system of marking scantlings is as follows. A circle with a broad arrow inside called the 'pass' mark, is stamped on each piece. Besides this, three figures are stamped on each scantling; the first indicates the length in feet, the second the breadth in inches, and the third the thickness in inches. Thus the figures 12 12 1 on a plank would mean that it is 12 ft. long, 12 inches broad and 1 inch thick. At present all the deodar timber comes from the Karamba forest near Mundali, about 16 miles from Chakrata. It is carried entirely on men's backs, the weight of a load being about 1½ maunds. The value of timber in the shed is from Rs. 10,000 to Rs. 12,000.

The Cantonment Forest Blocks.

The Cantonment of Chakrata was founded in 1865, when the forests lying on the slopes of the Chakrata ridge came into the hands of the Cantonment authorities and the two Blocks which were handed over for treatment to the Forest Department for one Working Circle under the plan.

In 1880, these two blocks were taken over, *viz.* Lurli with an area of 290 acres, and Suitoli with an area of 188 acres. They are both demarcated with masonry pillars numbered consecutively, and are treated exactly like reserved forests, with this exception, that any surplus revenue, after paying for maintenance and planting operations, is handed over to the Cantonment authorities. Up to date the surplus revenue has been about Rs. 1,305.

They are situated in the zone of the Ban oak (*Quercus incana*), the elevation varies between six and seven thousand feet, and the forest consists principally of ban oak, ayar, and buráns (*Rhododendron arboreum*), with the usual shrubs and under shrubs. In the damper ravines of Lurli we find moru oak (*Quercus dilatata*), laurels, the small ringal (*Arundinaria fulcata*), maple, holly, and other species.

The Lurli block has a general westerly aspect, while that of Suitoli is easterly, the result being that the latter is much hotter and drier.

In the two blocks, about ninety acres have been, at different times, sown and planted up with deodar, blue pine, chir, moru, and ban.

The Lurli Block. This block has been closed against fire and grazing since 1880, and plantations to fill up blanks were commenced in that year. In the beginning, by way of experiment, sowing in patches, both in horizontal and vertical lines, was resorted to. We inspected the plantation of 1880-81, area about 12 acres. Deodar and blue pine were sown in patches with a little ban oak, and vacancies were filled up from time to time by plants from the nursery below the Hospital and also from patches which had too many plants in them. This continued for 3 to 4 years, and in this way 16,000 deodar plants have been put out since the original sowings. Measurements taken in this plantation at different times give the following results, as recorded in the various journals:—

		Deodar.		Blue pine.	
		ft.	in.	ft.	in.
1885	Average height	0	9	1	7
1886	" "	1	0	1	0½
1887	" "	1	5½	3	1½
1888	" "	1	10 (720 plants)	4	0 (40 plants)
1891	" "	3	6 (281 ")	6	10 (49 ")
1892	" "	4	1 (589 ")	8	8 (71 ")
1893	" "	4	0 (150 ")	9	0 (88 ")

The deodar plants lower down the slope are taller than those higher up near the path. Very few of the former were measured this year, otherwise the average height would certainly have been more than 4 ft. In the sowings of December 1881, the patches were arranged in vertical lines, 3 ft. one below the other, the lines being 15 ft. apart. This system of sowing renders inspection exceedingly troublesome, and has now been abandoned for the horizontal method. It is difficult to distinguish between the plants resulting from sowing, and those put out.

We then inspected the ban oak and chir pine plantation of 1882. 8,400 patches in horizontal lines 15 ft. apart were sown with chir and ban oak in June 1882. They both germinated well, but the ban oak subsequently died owing to the southerly aspect and to the shallow rocky soil. Of the chir pine about one half have died. The altitude of this plantation is 6,500 ft. which is the upper limit of chir pine, hence it is not expected to do well. Those which have survived are chiefly found on south-westerly aspects. Measurements made in this plantation in past years give the following results:—

		ft.	inches
1885.	Average height	0	5
1886	" "	1	6
1887	" "	1	6
1888	" " (738 plants)	2	2
1892	" " (274 ")	5	1

in 1893 two of the longest shoots were 18" each.

These plants have thoroughly established themselves and are doing fairly well.

On the same slope, above the path, 3,500 pits were sown with deodar and blue pine in December, 1884. It was expected that these species might thrive at a higher elevation, but they all died out, and a partial resowing was made with ban oak; this, however, has not succeeded well, and the probability is that, at this elevation, a southerly slope is too hot for anything but chir.

We then proceeded to the slope below the hospital with a northerly aspect and fairly well covered with a forest of ban oak, and its companions. Here two plantations were made in 1882. In the one to the east of the nursery, about 6 acres in extent, 4,000 pits were planted with deodar taken from the nursery, two plants being put in each pit, and vacancies were filled up in 1885 and 1886. In the other plantation situated to the west of the nursery near the boundary of the block below the Hospital, 8,900 pits were prepared over an area of 12 acres and planted in July 1883, with two plants to each pit, the plants being taken partly from the nursery and partly from surplus stock from the other plantations.

The nursery from which these plants were taken contains a large number of seedlings, which will be put out next July. The nursery

is terraced, and each bed is raised, as deodar must be well drained. We noticed some of the original seedlings which had been left undisturbed in the beds; their height is three times as great as that of the transplants, owing to better soil, better cultivation, and to their roots not being injured. The original plants came from seed of 1881, which was a very good seed year. This plantation is considered a great success, and measurements made shew the following results:--

			ft.	in.
1886	Average height	(534 plants)	0	10
1887	" "		1	8
1888	" "	(1500 ")	1	8½
1891	" "	(160 ")	3	11
1893	" "	(553 ")	4	0½

This year only plants out in the open were measured; those in sheltered places, *e. g.* just below the Hospital, are 8 to 10 ft. high, and if these had been included, the average would have been much higher. Last year, the average length of the annual shoots was found to be 11 inches.

In the nursery, the deodar seedlings are pricked out into nursery lines in July of the first year, the spacing being 9" x 3". During the first year they are shaded by grass tatties, and after about 2 years in the nursery they are from a foot to 18 inches high and are ready to be put out into the forest. They are sometimes transplanted twice in the nursery lines in order to encourage the development of bushy roots and to prevent the formation of the taproot. This year there are about 5,000 deodar plants fit for planting, of which 3,000 will be put out in Korwa, and the balance in Cantonments.

On the boundary line, near pillar No. 4, we noticed the great contrast between the Government forest and village grazing lands, the former having thick grass, and natural seedlings of ban, ayar (*Pieris ovalifolia*), rhododendron and various shrubs, the latter shewing only bare slopes cut up by innumerable small paths with the grass grazed and burnt every year, and a few lopped trees scattered here and there.

A curious fact in connection with Lurli is that we find numerous blue pine saplings self-sown, but no parent trees are known to exist in this forest. It is possible that the seed may have been blown across the valley from the heights of Matkangra—a distance of two to three miles in a straight line,—or they may have been dropped by birds.

It is in this block that the junction of the Chakrata slates and shales with the Deoban limestone takes place, and this accounts for the richness of the soil.

In all these slopes the aid given to deodar seedlings by the natural growth of ban and ayar is considerable, and shews the importance of giving young deodar some sort of lateral shelter during the first few years.

Owing to the abnormally severe winter, the spring of 1893 was very late ; we found rhododendron in full bloom, and willow, birch and ayar only just coming into leaf. One of the pines in the plantation of '80-'81 bore a cone.

The Suitoli Block.

The area of this block is 188 acres. The aspect is principally east, and the soil is much drier than in Lurli, and not so deep.

Two plantations have been made in this block. One in 1882, with an area of 15 acres ; and another one in 1884, with an area of seven acres, lower down below the path.

In the upper portion of the plantation of 1882 no less than 20,000 trees have been put out from time to time, including deodar blue pine, chir, *Quercus serrata* from Assam, twenty or thirty different kinds of eucalyptus, Assam pine, &c., all taken from surplus stock from the forest garden. The result, as far as the exotics go, has been a complete failure, the indigenous trees alone thriving fairly well.

The recorded measurements in this plantation are as follows :—

		ft.	in.
1885,	Average height (20 deodar)	0	11
1886,	" "	1	6
1887,	" "	1	10
1888,	" " (25 deodar)	3	6
1891,	" " (149 ")	3	7
1893,	" " (109 ")	4	6

The lower plantation was sown with chir pine, in July 1884, and partially re-sown in 1887. The measurements taken are as follows :—

		ft.	in.
1885,	Average height	1	1
1886,	" "	1	6
1887,	" "	2	5
1888,	" " (18 plants)	4	1
1891,	" " (140 ")	5	8
1892,	" " (163 ")	5	6

The Forest Garden.

The forest garden is situated at an altitude of about 6,000 ft. on a spur running down from the dāk bungalow. Its area is 48 acres, of which 15 acres on a northerly aspect are covered with ban oak forest, the remainder consisting of undulating ground well adapted for the purpose of a nursery. It is irrigated by a canal which comes from the dhobies' ghat about half a mile away.

The object of the forest garden is to make experiments with exotic trees, and to grow fruit trees and distribute them to villagers. Vegetables were formerly cultivated for the troops, but under a recent Government Order this has now been abandoned.

The garden was made over to the Forest Department in 1881, and in 1882, about 500 fruit trees of the best kinds from Ranikhet, such as pear, apricot, apple, plum, peach, and cherry were planted, and in most cases are now bearing most excellent fruit. The

apples especially do very well, and they are readily saleable in Chakrata. The revenue varies every year according to the crop, but there is no doubt that in a very short time it will exceed the expenditure.

Each fruit tree is planted in a deep pit, filled with the very best manure. Pears have not been found to succeed, they are attacked, while unripe, by crowds of wasps and hornets.

About 180 species of exotic trees have been raised from time to time since the formation of the garden in 1881, including Australian acacias and eucalypti and conifers from Europe, China and America. The trees which have succeeded best are: *Pinus sylvestris*, *laricio*, *Pinaster*, and *Khasya*, and *Cryptomeria japonica*; this latter has been thoroughly established in the Darjeeling district and promises to develop into a valuable timber tree. It grows very rapidly, but it will hardly grow so fast in the colder climate of Jaunsar.

The portion under forest has been divided into 5 compartments; 3 acres were cut over in January 1885, 15 standards being left. The net profit on the wood cut was made over to the Cantonment authorities; no wood has been cut since, as there has been no great demand for it.

Several of the pines have been planted out among the coppice shoots of the areas cut over, where they are doing well. The Eucalypti have been severely damaged by the heavy snow last winter, and there is little chance of their recovering. The Maritime pine has begun to bear cones; and several seedlings have been raised from the cones of *Pinus Khasya*, both in Chakrata and below in Dehra Dún.

The Matkangra Oak Forest.

The Matkangra Block in the Deoban Reserved Forests forms a small special Working Circle for the provision of fuel for Military works lime-burning, and the annual yield is fixed at 4,500 stacked cubic feet yearly. As, however, the lime-burning has been stopped, the yield is now devoted to Chakrata fuel supply.

The crop consists principally of moru oak (*Q. dilatata*). The soil is rocky and reproduction is rather backward except immediately below parent trees, where dense thickets of moru seedlings have come up. To supplement the stock, two plantations were made, one above the Jádí road, the other below it.

The upper one, 25 acres in extent, was made in 1874 and planted out in 1875. In 1892, we found the average height of 154 plants to be 11 ft. 6 ins., and in 1893, the average height of 66 plants was 14 ft. 2 ins.

The lower plantation is 26 acres in extent and was planted in 1874 from seed raised in a nursery in 1872. Measurements made here give the following results:—

	ft.	ins.
1886, Average height (50 plants)	6	0
1887, " "	8	5
1888, " " (17 plants)	8	0
1892, " " (94 ")	14	0
1893 " " (179 ")	15	6

The old nurseries from which these plants were taken, contain trees which have been allowed to grow on undisturbed, only suppressed trees having been removed. Although on a small scale, they form a good example of an artificial pure crop of even age, 20 years old, and now about 20 feet high. The leaf canopy is complete, the lower branches have died off long since, and a thinning could now be made with advantage. The object of such a thinning would be to liberate the crowns of the future trees, *i.e.*, to give lateral space to the crowns of the dominant trees. Being a pure crop of even age the real dominant trees are at first sight hard to distinguish. Still, here and there, one tree has a wider crown than its neighbours, and a thicker stem. More room should be given to such a tree by removing one or more of those which are hemming it in. In other cases, the trees are so exactly equal that the only thing to do is to create a dominant tree artificially, as it were, *i.e.*, to select one and to remove one or more equal trees on either side. In any case the leaf canopy should be kept as close as possible.

The removal of the trees really suppressed in this case does not do much harm. As we are not dealing with a timber tree, the formation of a long clean bole free from branches is not important; moreover, the suppressed trees are saleable to make tool handles. But it should be remembered that in most cases the removal of suppressed trees is indefensible, *e.g.*, in the deodar thicket at Bodyar.

These two old nurseries in the sapling stage, are excellent examples of the necessity of making thinnings and of the great difficulty of doing so in a pure crop of even age raised artificially.

The following measurements have been made in these nurseries from time to time :—

		ft.	ins.
1886,	Average height	8	3
1887,	" "	13	6
1888,	" " about	15	0
1891,	" "	17	5
1893,	" " about	20	0

The boxwood of Matkangra is found in a shady ravine called the 'Bear Garden' among large limestone rocks, in a similar situation to that of Jadi under which a description will be given.

Lower down near the Bear garden we came across a fine specimen of the horsechestnut (*Æsculus indica*), and some of its seeds were germinating on the ground. The young leaf buds were just opening. We also saw *Rhus verniciifera* with the flower buds opening, a dense mass of purple anthers. The birch and holly were also shewn to the students.

The leaves of the Moru oak had mostly fallen, and the young foliage was just coming out in beautiful tints of olive green. The tree is never quite leafless, though the leaves remain on the tree for only 12 months. The ban oak, on the other hand, still retained most of the old leaves although the young foliage was appearing.

The Korwa Coppice.

The Korwa forest is what is known in Jaunsar as a "second class forest," i.e., the villagers have certain privileges such as collecting dead leaves for manure, and dead fallen wood. The area is 130 acres, the gradient of the slopes varies from 25° to 40° and the elevation from 5,200 to 6,700 feet. The rock belongs to the Chakrata series and consists of slate and shales with a band of limestone cropping out on the lower boundary of the forest just above the cart road.

When the forest was closed in 1880, an area of 70 acres was left open for the zamindars of Korwa for lopping and grazing, on the condition that they should lop very lightly. It was found that they severely lopped and pollarded the trees and hacked them in every possible way. On an adjacent slope is their own zamindari forest, which they strictly protected and it is now as good as any part of the Government forest. This privilege of lopping and grazing in the 70 acres was, in consequence, taken away from them, and the whole area has been put under coppice.

Portions of this area were coppiced in 1888-89, 1889-90 and 1890-91, no standards being left, and the reproduction from coppice shoots is very promising. A blank portion of the area was unsuccessfully sown in 1887 and 1888; the aspect was south-east. As will be seen from the table below the yield from the lopped portion was very much less than that from the closed area, being in fact about one-third.

The growing stock consists chiefly of Ban (*Quercus incana*), Burans (*Rhododendron arboreum*), Ayar (*Pieris ovalifolia*), Kaiphal (*Myrica supida*); and among the undergrowth we found *Berberis Lycium*, *Myrsine africana*, *Rosa moschata* and *Arundinaria falcata*.

The following table shows the outturn of the different coupes:—

Year of felling.	Area in acres.	No. of standards left.	Outturn in cubic feet stacked.		Compartments coppiced.	Remarks.
			Total.	Per acre.		
1881-82 ...	7	35	*8,490	1,213	2, 3, 4 (part), 8, 9, 10.	*Some charcoal was made which is not included in this.
1882-83 ...	4	30	0,470	2,367	4(part)5(part)	
1883-84 ...	3	35	7,150	2,383	5 (part), 6.	
1884-85 ...	3	55	*8,900	2,967	12	
1885-86 ...	...	...	...	...	11
1886-87 ...	3	60	4,350	1,450	19	
1887-88 ...	5	60	9,940	3,313	20	
1888-89 ...	Closed 1	32	6,750	1,687	...	
	Open 2	...	750	375	...	
1889-90 ...	Open 6½	...	5,650	904	...	
1890-91 ...	Open 3	...	2,050	683	13	"
	Closed 2½	54	3,820	1,530		

Year of felling.	Cpts. cut over.	Area in acres.	No. of standards left.	Outturn in st. cu. ft.	
				Total	per acre
1891-92	Part of 9 and 10.	1½	50	firewood 4,800	firewood 3,200
				Charcoal 1,074	Charcoal 716
1892-93	15	4	148	12,417	3,104

All the oak which can be split up is stacked on the spot and will eventually be taken to Chakrata; the pieces which cannot be split are sold to the Brewery, or converted into charcoal, and the Brewery also takes all the Rhododendron and inferior fuel, at the following rates, on the spot :—Rs. 7 per 100 st. cu. ft. inferior species, and Rs. 10 for oak.

There are more standards than usual in the coupe of this year as they are of small size. The main objects in reserving standards here are to protect the soil, shed seed, and to yield a larger supply of fuel. As many of the stools are too old to produce shoots, the importance of standards as seed bearers must not be over looked. Felling on a hill side always begins at the top, in order to avoid damaging stools already cut, and to prevent the stacks of fuel being knocked down. The various coupes are separated from each other by carrying paths, and at each corner is a small stone boundary pillar. The coppice is generally cut in February and March, before the growing season begins.

The coupe of 1881-82. Aspect N, area 7 acres. The growth of the shoots in this coupe has been very good : ayar, ban and rhododendron being the most numerous, but besides these, cherry, willow, kaiphal and other shrubs have sprung up, forming a dense thicket, and an excellent cover for the soil. Measurements taken at various times are as follows :—

1885	height	3	ft.	0.5	inches (all species)
1886	"	2	"	9	" (Ban only)
1887	"	4	"	5	" "
1888	"	6	"	0	" "
1890	"	6	"	7	" "
1891	"	6	"	11	" "

The oak and the rhododendron grow at about the same rate ; the ayar grows a good deal faster.

The coupe of 1882-83. Here too the growth is good, ban oak forming the greater part of the growing stock. Measurements are as follows :—

1885	height	2 ft.	6	inches	(all species)
1886	"	3 "	3½	"	Ban oak only
1887	"	4 "	2	"	"
1890	"	4 "	1	"	"
1891	"	7 "	5	"	"
1893	" about	8 "	0	"	"

It can readily be understood that the Forest School Students, who can only devote one morning to the Korwa coppice, have not sufficient time to take measurements in all the different coupes—at the most, they can do some here and some there, as a practical exercise.

Other measurements taken in April 1890, show the following results for ban oak :—

Coupe of 1883—84	Average height	5 ft.	4 inches
" 1884—85	"	4 "	9 "
" 1885—86	"	4 "	1 "
" 1886—87	"	2 "	2 "
" 1887—88	"	1 "	11 "

In all these observations, it is important to measure a large number of shoots fairly disposed over the whole coupe.

In the higher portion of the forest there are large blanks, in which endeavours have been made from time to time to stock the ground by direct sowing : Australian acacias, eucalypti, blue pine, and ban oak were successively tried, but the three former failed entirely, and the latter succeeded only partially. Finally the chir pine was sown in June 1889, and the average height of the plants in 1888 was 5½". The total number of patches sown was 5,740 ; they were arranged in contour lines of 10' apart, the patches being 5' apart in the lines. The patches were 2' long and 1' broad, and the seed was hand-sown in a line in the middle of the patch. The number of seedlings in six patches were counted in 1888 and 298 were found alive, giving an average of nearly 50 to each patch. The patches were made by contract at a cost of annas 12 per 100; each patch is protected during the hot weather by a grass cowl of a conical shape, with a stick in the middle to support it. For the purposes of our visit, some of the cowls had been recently removed, and we noticed that the seedlings had already begun to suffer from the exposure. These cowls are taken off at the first fall of the monsoon rains in July. Each patch was prepared in such a manner as to allow the water to drain off, a precaution which is also found necessary in the case of deodar.

In spite of these precautions, the sowings, generally speaking, were a failure, and now attention is being given to deodar transplants which are raised in the Lurli nursery in Chakrata. 1,500 deodar transplants were put out in July 1892, and 500 basketted plants in March of the current year, and these all seem to be doing well. The elevation is suitable for deodar and the locality is near the market.

The Korwa forest is one of several pieces of oak forest, which are worked as a special Working Circle chiefly for the supply of fuel to the Chakrata Brewery.

CHAKRATA TO BODYAR, *via* JADI: April 19th and 20th. ..

We inspected the boxwood forest of Judi, situated some 300 feet below the road, and found the tree in various stages of growth—from a small seedling to a full-grown tree. A good deal of damage had been done to the trees by snow avalanches. Boxwood grows naturally mixed with spruce, holly, maples and moru oak in cool shady ravines, among large rocks and boulders, and is found locally in certain places in the Himalayas, *e.g.*, in the Punjab, at Dattmair on the upper Tonk, near Chakrata, up the Jumna valley, and in Kumaun and British Garhwal. For the latter see *Indian Forester*, Vol. XI, No. 6, page 283. For the Punjab Boxwood see *Indian Forester*, Vol. XI, page 25. Boxwood is so valuable that it has been exported from here to England; the first lot sent, which weighed nearly 13 tons, realized £30 per ton. A second lot despatched in 1882, weighing 27 tons, realized £15 per ton. A third lot cut in the Kuphar forest on the Jumna in Tehri-Garhwal weighing 10 tons, was sent to England in 1884, and realized £20 per ton. The cost of cutting and carriage was approximately as follows:—

	Ra. per ton.
Cutting and carriage to Saharanpur and agent's charges ...	54
Rail to Karachi	57
Freight to London	38
Total ...	149

Receipts per ton .. Ra. 328

As is well known, boxwood fetches a high price for engraving, the very best quality only being adapted for this purpose. The best boxwood is found in Persia and Turkey in Asia,

An examination of this wood, made by the writer in 1882 in the East India Docks, London, showed that the Persian boxwood is more slowly grown than the Indian variety, and is probably in consequence more close-grained.

Boxwood for the market should be in pieces three feet long, with a diameter varying from 4 to 6 inches: it should be free from knots and cracks, and in case there is liability to split, it is advisable to make a longitudinal cut with a saw from bark to centre. The Indian boxwood has, at present, rather a bad name in the market, and there is not much likelihood of its being exported to England on a large scale. A small number of trees can be sold to merchants from Amritsar, where the wood is worth Rs. 5 a maund, and is used principally in the manufacture of combs.

On this march we noticed the character of the Deoban limestone series—the peculiar weathering, and the manner in which it is dissolved under the soil by action of rain water containing carbonic acid; it is interspersed with shales of various colours, generally grey, which yield a clayey soil.

Near Judi village, where we encamped for the night, we observed deodar trees lopped for litter and manure, and moru oak lopped for fodder. Further on, we found spruce fir lopped in the same way.

We also found good specimens of the male and female flowers of the spruce; the pollen was not quite ripe and the scales of the young cone were, of course, open. We noticed that the cones were upright, generally near the ends of the branches. *Acer pictum* and *Buddleia paniculata* were seen in flower, as well as *Prunus Padus*.

After passing Lokandi lani, we went through a small portion of Missau 2nd class forest, open to grazing, and then went on to Bodyar.

(to be continued.)

The Formation of Dew.

The invitation to discuss the Formation of Dew in the pages of the *Indian Forester* was very acceptable, as I had during the past camping season given the matter some attention and arrived at certain conclusions. An aqueous deposit on foliage may be of two kinds. First, when the moisture from the air is deposited owing to a fall in temperature reducing the power of retention of moisture. This is what is commonly understood by "dew." Second, when moisture is deposited by transpiration of aqueous vapour from the plant itself. In either case the amount of moisture in the air is responsible for the *visible* results. In the first instance this is self evident; in the second although the transpiration of aqueous vapour from the foliage may be actively proceeding, no deposit of moisture would take place if the air were dry. Given an atmosphere saturated with moisture, suppose a fall in temperature, then a "dew" deposit must take place on surrounding objects; but the air at the lower temperature being still saturated with moisture, evaporation cannot proceed and the aqueous vapour given off from the foliage is deposited as dew on the leaves. In such instances we notice dew on *both* sides of the leaf. Again given a moist but not saturated atmosphere in which little evaporation can take place, suppose a fairly equal temperature; in this case there may be no true dew deposit from the air and yet the aqueous vapour given off by the leaves may still be deposited in the foliage as dew; we should then remark, perhaps, that the under surfaces of the leaves were studded with dew drops whilst the upper were quite dry. It is evident therefore that there may be a dew deposit on forest trees whilst there is none on the ground or elsewhere where foliage is wanting. The conditions inducing the above phenomenon are most favorable in early spring when the atmosphere is not excessively moist and the temperature is equable. The want of evaporative power in the air alone affects the *visible* deposit on

the leaves of aqueous vapour given off by the foliage; the transpiration of aqueous vapour from the foliage may even be greater when there is no *visible* evidence of it. It is entirely immaterial whether the moisture in the air is in "the winds that blow above" or is due to "the vapour given off by the earth below." A *true dew* deposit is only possible when at a given temperature there is an excess of moisture in the air and when this temperature is attained. A *foliage dew* deposit is only possible when the evaporative power of the atmosphere is too feeble to permit of the absorption of the aqueous vapours given off by the plant. An abnormally small dew deposit in forests is traceable therefore in reference to true dew, to an abnormal deficiency of moisture in the air, irrespective of whether such moisture is acquired at a distance or locally. A small deposit of foliage dew may be due to local drought diminishing the output of aqueous vapour from the plant, but this *must* be accompanied by a dryness in the air which, by evaporation, prevents the deposit on the leaves of such aqueous vapour as is given off. It was most interesting to note that in large areas of forest in these provinces, the Sal tree did not flower this spring. The result of this soon became apparent in a most abnormal and beautiful flush of foliage; and, with the appearance of the young leaves over hundreds of square miles of forest, the atmospheric moisture increased and the temperature fell in a very marked degree.

O. C.

Land reafforested through the intervention of Prickly Pear.

The land near the sea coast in the Bandar, Rápalli and Bapatla taluks of the Kistna District is intersected by a net work of tidal salt creeks. For the most part it is very low-lying and is submerged by water from the creeks either at each high tide, or at intervals—for instance, during the rains; and consequently it is impregnated with salt. Such land is called a "parra."

For mile after mile sometimes these 'parras' present a barren waste: in Bandar taluk, for instance, there is a stretch of 'parra' exceeding 20 miles in length, and $1\frac{1}{2}$ miles in breadth. At first sight they seem hopeless for afforestation; but, as is explained herein, this is not the case.

The first vegetation that grows on these 'parras,'—which only exists when the submersion is not daily,—consists of small trailing patches of a herbaceous-looking plant, called locally "Yilakurru."* It possesses fleshy, succulent leaves, somewhat resembling stonecrop (*Sedum*) which are salt to the taste, are used by natives for making curries, and are eaten with relish by cattle when they get used to it.

* I have not yet been able to identify the botanical name of this plant, as I have been unable to find, so far, flowers or fruit. A. W. L.

After a time, a few patches of prickly pear are found, and once started this plant seems to spread rapidly. In the prickly pear the "Yilakurru" flourishes exceedingly; for, from a trailing herbaceous plant, it becomes a ligneous bush rising in places to 6 to 8 feet in height with a stem of 2 to 3 inches in diameter.

Then we find a grass * growing among these bushes of prickly pear and "Yilakurru", then spring up patches of two other different kinds † between the bushes; and then among the bushes of prickly pear and "Yilakurru" appear seedlings of different kinds of forest shrubs and trees, notably the following:—

Nim or vépa (*Melia indica*), Pála (*Mimusops indica*), Wulinda (*Diospyros Chloroxylon*), Uti (*Maba burifolia*), Tella tumma (*Acacia leucophloea*), Nalla tumma (*Acacia arabica*, where black soil is prevalent), Soapnut (*Sapindus emarginatus*), Date (*Phoenix sylvestris*) and Palmyra (*Borassus flabelliformis*),—the last three especially where the soil is sandy.

Finally, a regular scrub jungle is formed of the above-named species interspersed with prickly pear.

The prickly pear seems to form a soil of its own, possibly from its decayed leaves; for whenever the clumps of prickly pear and "Yilakurru" become at all large, it appears as if they rose from small mounds. These mounds become more and more pronounced, the larger the clumps become; and the scrub jungle is always situated on a higher level than any adjoining "parra." It may be suggested that the action is the reverse, and that the scrub jungle and higher ground is washed away by the water from the creeks; but, having considered carefully this side of the question, I examined the ground and the forest, and came to the conclusion that the scrub jungle was not eroded, but formed after the "parra."

In Repalli taluk, the gradual transition from the "parra" to the scrub jungle is completely shown.

In Bapatla taluk, one forest reserve consists of over 9,500 acres of this kind of scrub jungle, with Nim, Soapnut, Pála and other trees of about 15 feet high, with a few Palmyras scattered about. In another reserve in the same taluk, 600 acres, Palmyra and Date are more abundant than scrub. Prickly pear is still abundant in all these reserves, but it is evidently becoming subordinate to the scrub, which should be carefully kept uncut for some time longer to oust the former altogether.

The Prickly Pear has almost invariably been considered hateful to both Forester and Agriculturist, although advocates have been found for "the prickly pear as a protector to saplings" but in this case it appears to be a real benefactor.

The action of the prickly pear and "Yilakurru" between them seems to be (1) to extract the salt from the soil, (2) to render stable the mobile sandy covering of the soil, (3) to catch and protect seeds of jungle trees, (4) to form a more or less fertile soil.

A. W. LUSHINGTON. 26-5-98.

Note by Hon. Editor. 'The "Yilakurru" is clearly a species of *Suaeda* probably *S. nudiflora*. The grasses are probably (a) *Chloris barbata*, (b) *Eleuopos purbescens*, and (c) *Sporobolus diander*.

Obituary—G. H. Foster.

We regret to have to announce the death, at the Station Hospital, Cannanore, on the 29th April, of Mr. G. H. Foster, Deputy Conservator of Forests, Coorg. Mr. Foster, who was the son of Major-General Foster, now living at Southsea, was born in October 1849 and was appointed to the Forest Department in 1868; he served chiefly in the Central Provinces and successive Annual Reports bear witness to the excellence of the services he rendered there. In 1892, Mr. Foster was transferred to the charge of the Coorg Forests in which charge he remained until his death, doing excellent work in the reorganization of the department, more especially in the new settlement, and fire-protection. Socially, as well as officially, Mr. Foster's death will be deeply regretted, as he had a large circle of friends with whom he was most deservedly popular and much sympathy will be felt for his widow in her bereavement, which must be all the more severe in that she was absent in England, with their family of five children, at the time of her husband's illness and death.

II.—CORRESPONDENCE.

Destruction of Porcupines.

DEAR MR. EDITOR,

Could you or any of the numerous readers of your Periodical, instruct me as to the most expeditious manner of getting rid of Porcupines?

I have tried several methods, *viz.*—Digging them out of their burrows—Suffocating them with smoke. etc! but have **signally** failed to exterminate these pests.

I have offered as much as Rs. 3. per head for them but without success. Any hints that I may receive through the medium of *The Forester* will be most welcome.

R. J. P. P.

The Departmental Blazer.

SIR,

I see in a recent number of the *Pioneer* that we are at last within a measurable distance of a Departmental Blazer, and that it will probably consist of alternating stripes of green. I do not know who is responsible for this selection, but, as far as I have heard, no attempt has been made to get at the opinions of the majority of officers. Personally, I should much prefer a blazer on the lines of those used at Cooper's Hill or Nancy; that is a coat of uniform colour, say rifle-green, with a monogram or device on the pocket. The enclosed design for a badge is only a suggestion and is, of course, open to improvement. The crossed rifle and gun represent the Departmental bent for *shikar*, whilst the elephant, besides being the king of all big game, is symbolic both of the Forest Officer and the forests under his charge.

He resembles the Forest Officer in that he is a jungle walla, that he is popularly supposed to be able to do any amount of work, in any weather, and on any food, and that his pay is more kicks than rpees.

He is typical of the Forests in that overworking is generally fatal to him and that he is much easier to destroy than replace.

I have left the motto blank as, during this hot weather, my dog-latin would cause a certain outbreak of hydrophobia. If any one else can supply a milder and less dangerous description, the chance is now before him.

A friend suggests to me that "*Tectona Grandis*" would look well, sound well, and be, to a certain extent, appropriate; opinions, of course, differ; personally, I think that, although the latin is pure and perhaps harmless, the phrase itself is vague and might be thought technical.

G. R. L.

The design, which we regret we cannot reproduce, consists of an Elephant's head surmounted by crossed guns and with a label for motto beneath.

Hon. Ed

III.-OFFICIAL PAPERS & INTELLIGENCE.

Chief Forest Trees used to make Charcoal.

The Inspector General has recently sent round the following Circular. It ought to result in the collection of some valuable information on that branch of Forest Utilization.

"I have the honour to ask that you will be good enough 'to oblige me with a list of the forest trees occurring in your 'Circle, which are most highly appreciated for charcoal-burning ; 'together with such information as may be available respecting 'the percentage of weight lost in conversion in the case of each 'kind of wood, whether burned in the customary local fashion or 'according to European methods. Only species which grow 'gregariously, or in quantity sufficient to render them of economic 'importance for charcoal-burning, need be mentioned ; and, 'where possible, an estimate of the quantity available should be 'added."

Resolutions of the Forest School Board of Control.

Resolutions passed by the Board of Control for the Imperial Forest School, Dehra Dun, at sittings held on the 26th and 28th March 1893 in connection with the Final Examinations.

MEMBERS PRESENT.

MR. B. RIBBENTROP, C.I.E., *Inspector General of Forests, President.*

„ J. S. GAMBLE, M.A., *Director of the Forest School.*

Colonel J. C. DOVETON, *Conservator of Forests, Southern Circle, Central Provinces.*

Mr. H. C. HILL, *Conservator of Forests, Central Circle, North-Western Provinces.*

Mr. A. W. PEET, *Conservator of Forests, Northern Circle, Madras.*

„ E. P. DANSEY, „ „ „ *Bengal Circle.*

Mr. J. L. PIGOT, *Secretary.*

RESOLVED—

1. That, on the result of the final examinations of 1893, conducted under the superintendence of the Board, certificates be awarded to the under-mentioned students. In respect of the six students whose claim to certificates appeared doubtful, but to whom the Board, in the exercise of their discretion, gave certificates, the Director should report to the Conservators concerned the circumstances under which certificates were granted.

Final examinations,
1893.

I. Higher Standard.

- | | |
|-------------------------------------|-------------------------------------|
| (1) C. S. Rogers. | (18) W. J. Lane-Ryan. |
| (2) Gajaraju Mudaliar. | (19) D. H. Allan. |
| (3) Dbanjishah Avasia. | (20) Kuli Charan Varma. |
| (4) Hari Keshav Washikar. | (21) Gopal Krishna Dandawati. |
| (5) T. Arumugam Mudaliar. | (22) T. S. Brito. |
| (6) W. B. Jackson. | (23) Rajagopal Naidu. |
| (7) A. B. Myers. | (24) V. Ethirajulu Naidu. |
| (8) S. Ramasawmiah. | (25) W. G. J. Peake. |
| (9) S. Kuppasawmy Chetty. | (26) R. H. Cole. |
| (10) P. Venkatakrishnama
Naidu. | (27) Bhawani Das. |
| (11) Krishnaji Ganesh
Javadekar. | (28) A. P. Ramachendra
Mudaliar. |
| (12) P. S. Govinda Rao. | (29) Gurditta Mal. |
| (13) A. M. Sawyer. | (30) E. J. D. Pierce. |
| (14) Ramnath Mukerji. | (31) L. Venkanna Naidu. |
| (15) C. E. Allen. | (32) Abdul Haq. |
| (16) H. E. Kelly. | (33) N. S. Anantacharlu. |
| (17) R. F. Colaco. | (34) Kanhya Lal. |

II. Lower Standard.

- | | |
|-------------------|-----------------|
| (1) Shyam Sundar. | (3) Harji Ram. |
| (2) Akbar Khan. | (4) Sundar Lal. |

No certificates with honours were granted by the Board in either standard.

2. That bronze medals be awarded, for the subjects noted, to the undermentioned passed students:—

- | | |
|---|-----------------|
| 1. Hari Keshav Washikar : | } Sylviculture. |
| 2. C. S. Rogers : | |
| 3. A. B. Myers : Surveying. | |
| 4. C. S. Rogers : Forest Engineering. | |
| 5. K. Gajaraju Mudaliar : Botany. | |
| 6. Krishnaji Ganesh Javadekar : Herbarium. | |
| 7. Hari Keshav Washikar : Forest Law. | |
| 8. Hari Keshav Washikar : Physical Science. | |
| 9. S. Ramasawmiah : Mathematics. | |

10. Shyam Sundar, Lower Standard : general proficiency.

3. That it is undesirable to grant Lower Standard certificates to the seven students of the senior Upper Class who failed to obtain Higher Standard certificates.

Upper Class failed students.

4. That, with reference to a proposition submitted to the Board under which students who fail in the monthly examinations or in the annual examinations at the end of the first year should be required to leave the School, the Director, in the exercise of the discretionary powers vested in him under rule 8 of the existing School Rules ("General," is competent to deal with students who, at any time during

Backward students:
how to be dealt with.

the School course, show that they are unable to follow the lectures with any prospect of obtaining a certificate at the final examinations. The Director should make use of this power, and either remand unpromising students or arrange for their transfer to the Lower Class.

5. That, with reference to a proposal placed before the Board, to the effect that greater importance should in future be given to the annual examination of the junior students, and that the marks allotted at that examination should count more towards the final results than the marks allotted at the monthly examinations, no change in the existing practice, which was discussed at previous meetings, is desirable; and that the proportion of marks now allotted to the monthly examinations is sufficient.

6. That, with reference to the proposal, submitted by the Comparative importance of written and verbal examinations. Instructor in Forest Engineering, to set two papers instead of one at the final examinations in that subject and in Surveying, the number of examination papers should be rather reduced than augmented. In the opinion of the Board, a single paper in each subject is sufficient; but the question should be brought forward at the next meeting for further discussion and consideration as to whether greater importance should not be given to the oral tests at the final examinations. The Board desire that, in the meantime, the opinions of the School teaching staff on this subject should be obtained.

7. That it is, from every point of view, desirable for the Professors of silviculture to become acquainted with silvicultural conditions other than those which they study within the School Circle and during their short tours with the students. Facilities should accordingly be given to them, either during the vacation or at other times when they can be spared or replaced, for the purpose of visiting localities of special interest in the various provinces, such as teak forests in southern India or Burma, or sal forests in Oudh and Bengal.

8. That a Manual of Forest Engineering should be prepared. The present course of engineering as taught at the School meets all requirements; and the Board are therefore of opinion that the syllabus of that course should form the basis of the proposed manual. The Board recognise the value of the notes of lectures, delivered by Lieutenant-Colonel Bailey and Mr. Hobart-Hampden and edited by the latter officer, and consider that those notes should be fully utilised in the preparation of the work. The notes, however, will require considerable addition and rearrangement in order to render them complete and in conformity with the School syllabus. The manual should be elaborated beyond the requirements of the School curriculum, so as to be

useful for reference to officers of the department and to the public generally. To carry this proposal into practical effect, the Board consider that, in order to utilize local experience and collect examples and illustrations of local works or practice, the preparation of the manual should be entrusted to an editor with authority to correspond with Conservators throughout India. The present Instructor in Forest Engineering at the School, Mr. C. G. Rogers, is qualified for this duty, and the Board propose that he should for the purpose be forthwith relieved, until the 1st July next, of all other duties in connection with the School. The Board expect that during this period Mr. Rogers will prepare a proof of the manual, which should then be circulated to all Conservators for such suggestions as they may have to offer.

9. That the Inspector General of Forests be requested, with reference to the Board's Resolution No. 11 of 1892 and the subsequent correspondence on the subject of volunteering at the School, to consider whether steps could not be taken to arrange for a course of riding lessons for *all* students at the School; and at the same time to make some provision, by money-grant or otherwise, for the requirements in horses of such of the students as belong to the Dehra Dun Mounted Rifles.

10. That, with reference to the intimation conveyed to the Inspector General of Forests by the Government of India, in endorsement No. 203-4, dated 26th January 1893, to the effect that the utilisation of the services at Dehra and Poona of the Assistant Agricultural Chemist should be arranged for by the Board, the Board are apparently not in a position to act as desired, since necessary information, respecting the period in each year during which the Chemist must be at Poona, as well as other essential particulars, have not been placed at their disposal. At the same time, the Board desire to record that it had been understood that the services of the Chemist would be available at Dehra for the whole period from 1st July to 31st October, and that they consider he can be fully employed during that period.

11. That—with reference to Resolution No. 15 passed at the meeting of 1892, and after consideration of the Circular of the Government of India on the subject (No. 22-F., dated 25th July 1892), and of replies of Local Governments and of the Director of the Forest School thereto, as well as of draft proposed rules submitted by the Director—the Forest School Rules detailed below be adopted. Sections I and III of these Rules relate to the constitution of, and the studies and discipline at, the School, and conform in all material particulars to the existing orders or practice. The Rules of Admission contained in Section II, have been framed after a careful examination of those suggested by the Government of India in the Circular above-quoted. The

Board are unanimously of opinion that, while the existing rules for admission to the School require modification and amplification in important respects, it would be inexpedient to adopt the rules suggested by the Government of India, which do not meet the requirements of the Forest Service. The Board, acting on the suggestion of the Supreme Government that recommendations for a revision of the regulations under which students are now admitted should take the form of draft rules, have accordingly prepared a complete set of Rules of Admission. The Board desire that the Inspector General of Forests should move the Government of India to accord their sanction to the issue of these rules, which should be published in conjunction with the rules contained in Sections I and III. The Board are of opinion that the simplification of the existing rules—the meaning of which is often misunderstood—and the extended publication of new regulations, are matters of pressing necessity, and desire also to record their belief that the rules in their entirety as now submitted, while meeting the requirements of the School, will suitably provide for the recruitment of the provincial forest services on the lines prescribed by Government in the Forest Department Code.

Forest Conservancy in India.

Forestry in India is a comparatively modern institution. In former times, no doubt, considerable areas were scrupulously protected in many parts of the country; but, wherever this was the case, the forests were kept as game-preserves for the pleasure of princes and great nobles. The idea of conserving forests in order to maintain an uninterrupted supply of forest-produce useful and even necessary for the people,—the idea of maintaining a proportion of the country under forests on account of the indirect benefits conferred on the Empire at large by the very existence of forests,—was never thought of by former governments. Even during the earlier times of British sway, the economic value of forests was not recognised, and they were considered more in the light of impediments than otherwise to the increase of cultivation, and consequently to the general prosperity of the empire. This period, however, has passed away; and the necessity for the maintenance and conservative treatment of forests, as a mainstay of agriculture, is now almost universally recognised, while Forest Conservancy is regarded as a duty of the State.

India is not, like Europe, a forest-growing country throughout; its position in a tropical and subtropical climate prevents this, and areas which, with a lesser evaporation, such as takes place in temperate and cold zones, would be clad with dense forest growth, are here arid and may even be desert. Thanks, however, to the barrier which, in the form of the Himalaya, separates the north of India from the rest of the Asian continent, and in consequence of the

pronounced peninsular formation of the Empire, the greater part of the country is suitable for the growth of natural forests. India is a country of extremes, and contains, on the one hand, ever-green forests of a luxuriance and density such as the imagination can hardly picture, and, on the other hand, deserts. The distribution and character of the Indian forests is due, in the first instance, to the more or less plentiful supply of rain, and next to elevation and the influence of the tides. The distribution of the rains in India within distinct periods of time is as marked and accentuated as anywhere in the tropics, and, thanks again to the formation of the country, the monsoons extend far north of the Tropic of Cancer. There are two monsoons, the more important being the summer or south-west. Within the direct influence of the full force of the monsoon rains, the country is covered with evergreen forests. Where the rainfall gets less copious, these change into deciduous forests, gradually blending, with still decreasing rainfall, into dry forests, and ending in unproductive deserts.

The evergreen forests created by the influence of the south-west monsoon occupy the west coast of the peninsula, up to the ridge of the mountain chain separating the moisture-yielding sea from the rest of the continent. In the same way they are spread over the coast districts of Burma and Chittagong, and along the foot and on the lower slopes of the eastern Himalayas. The evergreen forests, due to the winter or north-east monsoon, occupy the Carnatic.

The deciduous forests, which occupy the larger part of the peninsula and Burma and a considerable proportion of the Andamans, are of the greatest importance for the forester, the consumer, and the State. They contain the well known and most valuable species of timber, such as teak, sal, ironwood, sandalwood, red sanders, and many others: also the padouk (*Pterocarpus indicus*), which is found in considerable quantities and of large dimensions in the Andaman Islands. This tree has, of all Indian timbers except teak, probably the most promising immediate future. It yields the best wood for ordnance purposes and carriage-building, and is sure to rival mahogany for cabinet-work. The timber is stronger than teak in every direction, lasts longer, is much handsomer, does not warp in seasoning, and only weighs 15 to 20 lb more per cubic foot.

The dry forests are situated in Rajputana and the Punjab, and spread over a large extent of Native States. Towards the north and north-west they become richer and gradually blend into deciduous or alpine forests, whereas they get drier and drier towards the west and southwest and disappear into the deserts on both sides of the lower Indus, where the courses of perennial rivers alone are fringed by a belt of arbori-vegetation.

Alpine forests are found within the Indian Empire along the whole of the Himalaya mountain chain from Assam to Hazara, in the mountains of south Afghanistan and Baluchistan, and on the higher mountain ranges in Burma.

The tidal forests are situated along the greater part of the coast of India and in the deltas of its rivers.

The foregoing are, shortly summarised, the physical capabilities of India as a forest-growing country. There can be little doubt that in pre-Vedic times the greater part of the Empire was covered with dense forests, which were gradually opened out by Kshatriya settlers along fertile valleys and main streams. At that time, and long after, the country was probably more fruitful and the climate less fierce than now, at least if any trust can be placed in the descriptions of Fa-Hian, the great Chinese traveller who visited India in the fourth century, and who described the climate as neither hot nor cold. The destruction of the forests on a larger scale was left to the invaders from the north—nomadic tribes who had been accustomed to roam from pasture to pasture, and who fired alike hills and plains, and destroyed the forests wherever they went. The sway of these invaders extended over upwards of 750 years; and when, after the battle of Plassey, the foundation of the present Indian Empire was laid, and province after province was conquered, the forest areas had already, over considerable portions of the country, been reduced below the minimum necessary for its well-being, though other portions of the vast Empire were still covered with almost virgin forest.

British rule, instead of putting an immediate stop to further devastation, gave in the beginning a new impetus to destruction. As already stated, the watchword of the day was to increase the area of cultivation at the cost of the still existing forests, and this policy was carried on for years without any enquiry into the merits of each case. Naturally, incalculable harm was done by such inconsiderate destruction of forests, especially in the more populated districts where the demand for new land was greatest, and where the forests were often already of less extent than the state of the country demanded. Large areas, through not immediately destroyed, were alienated by settlements and grants, and were thereby withdrawn from further active interference on the part of Government. Security to life and property enabled the peasants and herdsmen to graze their cattle far from their homes and unprotected, and at the same time cattle increased in value. Herds naturally multiplied, and additional grazing areas being required were cleared by fire, thereby opening the way to future famines and distress. Railways soon spread over the country, and forest growth disappeared with an incredible rapidity within the reach of their influence, partly on account of the direct demands made on them for construction works—demands which were frequently supplied in a wasteful and reckless manner—partly on account of the increased impetus given to cultivation.

It was only when failures to meet local demands for public works were brought to notice, that the value of the forests was gradually recognised. At first, attempts were made to meet such

local failures by local measures, but the insufficiency of this proceeding was rapidly brought to light, and it came to be understood that a question of such general magnitude and importance could only be efficiently grappled with by a special organisation. It was thus that the Forest Department came into existence.

As a matter of course, it rested with the Government to show the lead, and the first step in the new direction was naturally to ascertain the extent of the forest property still remaining in the possession of the State, and in what measure such property was burdened by rights in favour of the peasantry. The Oriental Governments, from which the British Government inherited its forest property, never recognised the accrual of any prescriptive right; but, on the other hand, anybody was accustomed, without let or hindrance, to get what he wanted from the forest, to graze his cattle where he liked, and to clear jungle-growth for cultivation wherever he listed. This state of things, it is self-evident, did not permit of systematic forest management, and it became clear that a Forest Law and a Forest Settlement were urgently required. It was necessary that the Forest Settlement should define (a) the forests in which the ownership of the State was still absolute; (b) forests which were the property of the State, but which were burdened with legal rights, prescriptive or granted; and (c) forests, the property of individuals or communities, in which the State had rights over all or certain kinds of growing trees. After several local Rules and Acts had been introduced and had been in force for a longer or shorter time, the first Indian Forest Act was passed in 1865. This was, however, found wanting in many important respects, and was replaced by the Act of 1878. Even in this new Act, however, faults were at once recognised, and separate Acts were passed for Burma and Madras in 1881 and 1882 respectively. All three Acts provide for the formation of Government reserves and the settlement of rights within them; also for the constitution of village forests; and they contain forest police rules necessary for the protection of Government forests and forest-produce. The Indian Forest Act contains in addition provisions for the creation of protected forests. All three Acts provide for the control of Government over forests not belonging to the State, if such control appears necessary for the public weal, or if the treatment which such forests have received from their owners injuriously affects the public welfare or safety. More recently, special Forest Laws for the newly-annexed province of Upper Burma and for Assam and Baluchistan have been passed by the Indian Legislature, and these contain several distinct improvements on the older Acts.

In the Central Provinces and Bengal, forest reservation had made rapid progress under the wise guidance of Sir Richard Temple, and large areas could at once be declared State Forests under the Act of 1878. The rapid strides which forest reservation has made in Bombay are due to the wisdom and foresight of the same eminent statesman, other provinces are following the same line

with more less vigour, as may be gathered from the following table for 1891-92 :—

PROVINCES.	FOREST AREA, IN SQUARE MILES.				Proportion of Forests to whole area of Province	REMARKS.
	Reserved.	Protected	Unclassified.	Total	Per cent	
Bengal ..	5,211	2,181	4,534	11,926	8	
N. W. P. and Oudh ..	(a) 8,780	93	54	8,916	4	(a) Includes 78 square miles of <i>leased</i> forests.
Punjab ..	(b) 1,715	481	3,874	6,070	6	(b) Includes 343 square miles of <i>leased</i> forests.
Central Provinces ..	19,680	..	303	20,073	23	(c) Includes 461 square miles of <i>leased</i> forests.
Burma (Lower) ..	(c) 5,615	..	..	5,615	7	(c) Includes 461 square miles of <i>leased</i> forests.
Burma (Upper) ..	(d) 1,059	(e) 16,461	..	17,520	22	(d) Includes 113 square miles of <i>leased</i> forests.
Assam ..	8,612	912	5,435	9,959	22	(e) Includes 113 square miles of <i>leased</i> forests.
Coorg ..	113	743	..	856	54	(f) Includes 113 square miles of <i>leased</i> forests.
Ajmore ..	139	..	..	139	5	(g) Exclusive of the area of India-rubber forests of which it is not possible at present to form an estimate even.
Baluchistan ..	82	..	..	82	..	(h) Includes 37 square miles of <i>leased</i> forests.
Andamans ..	..	..	1,957	1,957	98	(i) Includes 154 square miles of <i>leased</i> forests.
Berar ..	2,231	..	2,175	4,406	25	
Total Bengal Presidency	48,256	20,871	18,422	82,549	12	
Madras ..	(j) 7,175	(k) 9,404	1,804	71,883	21	
Bombay ..	10,170	4,319	..	14,489	11	
GRAND TOTAL ..	60,601	34,594	19,723	114,921	13	

* These figures are for 1890-91.

The organisation of the Forest Department was gradually developed at the same time under the energetic management of Sir Dietrich Brandis. The Department, of which the superior staff was re-organised in 1891, is divided into an Upper Controlling Staff (including Conservators, Deputy and Assistant Conservators), a Lower Controlling Staff (providing for Extra-Assistant and Extra-Deputy Conservators), a Protective Staff (composed of Rangers, Foresters, and Guards), and an Office Staff. The Upper Controlling Staff numbers at present 183 officers, of whom 63 per cent. have received a scientific training in forestry and were appointed in England by Her Majesty's Secretary of State. Most of these officers were trained in France, some in Germany; but since 1885, the education of such officers has taken place at the Royal Indian Engineering College, near Windsor. The forest range is the unit of the present organisation, and the men intended for such charges, as well as those intended for employment in Native States or by wealthy native land-owners, are trained in the Imperial Forest School at Dehra Dun in the North-Western Provinces. Since the establishment of the School in 1878, 166 Rangers have been thus trained. The organisation of the Controlling Staff has been, as pointed out above, completed; that of the Executive Staff, which must ultimately form the mainstay of forest administration in India, is now under the consideration of Government, and considerable additions to the existing numbers of Rangers, Foresters, and Guards will probably be made in almost every province.

The protection of the forests in which, previously to the creation of the Forest Department, no restrictions of any kind existed, was, as may be supposed, a matter of the greatest difficulty. Boundaries were defined where no boundaries previously existed, or at least boundaries which had never formed a restriction had, under the Forest Law, to be respected. Previously, anybody might go into the forest, cut down in a most valuable portion all young trees over any extent of forest he wished, kill the mature ones and make a bonfire of the whole, sow in the ashes, reap a crop, and similarly destroy another area next year. A man wanting covering leaves for cigarettes might cut down a tree without let or hindrance; a cattle owner requiring more extensive pastures, might fire and re-fire the forest, till it became sufficiently open to yield a dense grass crop; cattle and even goats might graze and browse in the midst of forest reproduction. All this had to be stopped.

As regards general protection, the laws, being new, had to be worked leniently. This has been done, and the progress reported from time to time is satisfactory. Where forests suffer, especially under excessive grazing, they do so more from rights granted and privileges permitted during the time of settlement than from subsequent breaches of forest rules. The greatest benefit conferred lies in the stopping of the above-described method of cultivation, locally known as *kumri*, *jhum* or *taungya*, in the Government forests of almost all provinces. This step affords, in the Central Provinces alone, protection to at least 5,000 square miles, which otherwise would have been rendered bare once in every fifteen to twenty years. In the protection of forests from fire there is still much to be learned and done, and in almost every province it is necessary to depend more on fire-tracing and fire-watching than on the help given by legislation. The law, while sufficiently stringent for reserve and even for protected forests, is quite inadequate to protect them from fires spreading into them from adjacent private forests and grazing lands and from open forests belonging to the Government, though the Burma Government has recently shown that most valuable results may be attained by insisting that the conditions of the law in regard to prairie fires shall be respected outside the forest areas. In all these classes of areas, fires intentionally lighted still often occur, and spread wherever the wind may carry them. This, apart from the mere protection of the Government forests, is probably one of the most important questions connected with forestry, and consequently with agriculture, in India. These annual fires are the main reason of the barren condition of most of the Indian hill ranges, and are closely connected with distress and famine. Many prejudices will have to be overcome in order to check this evil, and it will take the full power of Government to do so.

In the meantime practical steps have been taken to prevent the spread of external fires into the more valuable Government forests. During 1891-92, 24,000 square miles were thus protected

from fire, at a total cost of Rs. 2,42,000, and the following table gives a *résumé* of the work done:—

*Results of fire-protection in the forest circles administered
by the Forest Department.*

CIRCLES.	TOTAL NUMBER OF ACRES.			Total cost.	COST IN PIES PER ACRE.	
	Attempted.	Failed.	Protected.		Attempted.	Protected.
Madras Presidency ..	2,041,676	170,483	2,771,243	45,318	2.9	3.1
Bombay " ..	6,620,160	1,293,289	5,896,880	16,571	0.5	0.6
Bengal ..	1,264,115	256,420	1,007,695	12,492	1.9	2.4
North-Western Provinces and Oudh ..	1,741,038	61,797	1,679,241	48,714	5.4	5.6
Punjab ..	189,913	23,504	166,322	2,106	2.1	2.4
Central Provinces ..	2,476,395	135,008	2,841,387	52,191	4.0	4.8
Upper Burma ..	682,320	563,770	128,550	805	0.2	1.2
Lower " ..	320,867	8,388	317,529	31,844	18.8	18.10
Assam ..	730,556	88,556	642,000	19,488	5.1	5.8
Coorg ..	130,715	16,274	114,441	5,390	7.8	8.9
Ajmere ..	89,328	..	89,328	45	0.1	0.1
Berar ..	727,943	7,753	720,199	7,780	2.0	3.1
TOTAL ..	17,914,029	2,550,223	15,364,706	2,42,189	2.6	3.0

* These figures are for 1890-91.

By fire-protection, the regulation of grazing, and the general protection of the forests, ample reproduction is ensured as a rule, after a shorter or longer period, in the more valuable forests of India, though, in some of the drier regions, areas thoroughly desolated and with unfavourable soil will resist improvement for the time being.

Most Indian forests are of a mixed character, containing only one or a few valuable species which repay the cost of working. Moreover, all age-classes are generally represented on the same area, and this necessitates working by selection (*Fr. jardinage*). It is self-evident that these facts make the problem of forestry—to secure a continuous yield proportionate to the stock on the ground without causing the deterioration of the forests—extremely difficult. In previous times the work was carried on haphazard, or based sometimes only on an exceedingly rough valuation of the growing stock. As a rule, however, the demand and requirements for forest-produce were the only considerations by which the exploitation was governed, and no attention was paid to the potential capabilities of the forests. Of late, however, more pretentious working-plans have been made, and several provinces have

organised a division or staff for this work only. The working-plans made in the provinces under the Government of India are scrutinised and audited by the Inspector-General of Forests before they are passed by the Local Governments. The working-plans take special notice of all measures necessary to encourage and, what is infinitely more difficult in a mixed forest, to guide natural tree reproduction ; and they prescribe any artificial means—such as girdling of inferior trees, dibbling in of seed, etc.—that are required to assist natural regeneration of the species or admixture desired. The forests controlled by the Department are, however, by far too extensive, and markets at high rate are not at present sufficiently general and secure to permit of the extensive use of the more elaborate methods of European sylviculture. In special connection with the preparation of working-plans, the Forest Survey Branch of the Imperial Survey Department has been formed.

The exploitation of timber, at least of the more valuable timber, from Government forests, is carried out partly through the direct agency of the Department and partly by contractors. Of minor forest-produce, the most important at present are grass, hirda fruit (*Terminalia Chebula*) bamboos, catch, cardamoms, catechu, and lac ; but there are many others of lesser value.

The estimated yield in timber and fuel, in cubic feet of all Government forests was as follows during 1891-92:—

	Timber	Fuel	Total
	c ft	c ft	c. ft
Bengal	7,260,725	21,495,028	28,755,753
N W P and Oudh	4,204,645	7,673,285	11,877,930
Punjab	2,381,030	28,968,083	31,349,113
Central Provinces	1,756,433	6,760,265	8,516,698
Burma (Upper)	7,352,485	1,506,598	8,859,083
Burma (Lower)	11,773,094	2,802,034	14,575,128
Assam	2,246,290	2,608,988	4,855,278
Coorg	398,844	196,000	594,844
Ajmere	7,300	191,098	198,400
Baluchistan	6,122	152,588	158,710
Andamans	415,874	1,150,636	1,566,510
Berar	621,454	1,558,341	2,179,795
Madras	3,086,837	13,987,173	17,074,110
Bombay	6,842,524	26,422,016	33,264,540
TOTAL.	48,363,759	115,472,133	163,825,892

The following table exhibits information in respect of the sea-borne exports of forest-produce from India to foreign countries in 1891-92 :—

ARTICLES.	Quantity in tons of 20cwt. in the case of Teak, cubic tons	VALUATION AT PORT OF SHIPMENT	
		Total.	Per ton.
		Ra.	Ra.
Caoutchouc Tons	467	11,72,370	2,510
Shell-lac "	5,514	60,67,924	1,100
Lac-dye "	2	2,500	1,250
Sandal Ebony and other ornamental woods	(Information not available.)	8,41,938	...
Cutch and Gambier Tons	9,853	31,72,992	322
Myrabolams "	39,540	39,36,902	100
Teak "	48,190	47,48,517	99
Cardamoms "	124	3,18,957	2,572
Total in 1891-92 ...	...	2,02,62,100	...
" 1890-91 ...	.	1,77,40,556	...
Increase in 1891-92 ..	.	25,21,544	...

Arrangements have recently been made for the dissemination of information on these and other important Indian forest-products among the commercial community and other persons in Europe interested in the trade. Monographs on the more important products appear from time to time in the pages of the *Indian Forester*, and are subsequently republished in the series of penny hand-books issued by the Imperial Institute in London.

The financial results of Forest Administration in India have been as follows :—

QUINQUENNIAL PERIODS.	Revenue.	Expenditure.	Surplus.
	Ra.	Ra.	Ra.
1864-65 to 1868-69 (annual average)	37,38,189	23,81,732	13,56,457
1869-70 to 1873-74 Ditto ...	56,25,693	39,89,632	16,36,061
1874-75 to 1878-79 Ditto ..	66,55,913	45,78,372	20,79,541
1879-80 to 1883-84 Ditto ...	87,84,514	56,07,452	31,76,062
1884-85 to 1888-89 Ditto ...	1,16,68,148	74,23,956	42,44,192
1889-90	1,53,03,572	80,12,518	72,91,054
1890-91	1,49,67,135	80,63,125	69,04,010
1891-92	1,53,63,706	80,22,625	73,41,081

(Extract from the Hand-book of exhibits of the Indian Forest Department, at the Chicago Exhibition, 1893.)

IV—REVIEWS.

Report on the Botanical and Afforestation Department, Hongkong, for 1892.

This Report is short, but shows that there was a great deal of planting work going on as usual during 1892, for 295½ acres were planted up, 356,653 trees being used, chiefly '*Pinus sinensis*'. It is, however, fair to note that only about one half of these were transplants, the rest being sowings 'in situ'. The revenue from thinnings, etc., was 601 dollars—the expenditure is not given.

As usual, fire was the great difficulty of the year, for there were 63 fires, which destroyed 2,000 trees. A system of registering graves was set on foot so that when John Chinaman performs his usual ceremonies at the graves of his ancestors and fires the forests, the forest officers may be able to lay their hands on the right person.

The '*Pinus sinensis*' seems very easy to grow,—perhaps it might be found to thrive in Southern India, near the sea, and we recommend its being tried, at any rate on the hills. It is a pity that the reports tell us so little of the system of work and about the treatment of the forests.

Forest Administration in Jodhpur, 1891-92.

The report on forest administration in the Jodhpur State for the financial year 1891-92, was written on the 13th December, 1892, and reviewed by the Musahib Ala, Marwar, on the 1st October of the same year! Since the initiation of Forest Conservancy in Jodhpur, Colonel Loch, Assistant Resident, has had charge of all forest matters, with Lala Daulat Ram Bhimbat as Superintendent, but during the year under review the Department changed hands and was placed directly under the orders of the Prime Minister Maharaja Dhiraj. Col. Sir Pratap Singh, K.C.S.I., A well deserved tribute of praise is given to Col. Loch for his able supervision during these four years.

The area of the Jodhpur forests is 1,91,000 acres, or about 298 square miles; and the whole is under fire protection, though some two square miles were burnt during the year. The causes of these fires is thus stated:—

"Most of these fires were caused by people cutting grass and removing dry wood from the forests. The Minas and Bhils are so much addicted to smoking, that they can hardly work

without smoking after every quarter of an hour. They make fire from flint and have tobacco and a "chilam" always on their person.

In the Siwari forest fire came from Odeypore territory and burnt an area of about 34 acres. No fire took place in Sojat Range during the year, which is attributed to the scarcity of the rainfall and absence of grass and other inflammable materials from the forests. Moreover these forests are better protected owing to good management in the adjoining Government forest.

Nearly all of the Odeypore forests were burning during the dry season and it was very hard work for the establishment to prevent those fires crossing into our forests.

A very objectionable practice is in vogue among the Dak runners running from Bijapore to Odeypore territory. They have to run through the best part of the Behra Reserve during the night and instead of burning a lantern or other convenient sort of thing, carry dry Dhow wood torches in their hands. They do not apply rags or oil as is usually done with the torches but only beat into a brush one end of the Dhow stick and burn it dry. As they run against the wind, the sparks and hot cinders are scattered in all directions causing fire to a large area. The matter was brought to the notice of the Deputy Post Master-General, Rajputana, and he promised to put matters right, but nothing has been done up to this."

The best plan in the Behra reserve would be to clear broad fire lines on either side of the road along which the dak runners pass.

The cost of fire conservancy in Jodhpur is 0.06 pies per acre, a wonderfully low figure. A long fire line was cleared between Marwar and Meywar and Merwara over 100 miles; and no charge for this appears in the accounts. The only cost is that of fire-watchers—nothing is charged for clearing and burning lines. Perhaps, as in Ajmere, the grass is so valuable that people gladly remove the grass free, and assist in burning whatever remains without payment—this shews how impossible it is to compare the results of fire conservancy in the various provinces, or to give them a figure of merit.

Owing to the famine, consequent on a scanty rainfall during two or three years which culminated in 1891 a very dry year, all the forests were thrown open to grazing of cows and buffaloes, and the lives of several thousand cattle were saved.

Natural reproduction is said to be a failure, as the seedlings which spring up during the monsoon are subsequently killed by drought, moreover the sheep and goats of the Grassias in several forests, destroy whatever seedlings are left. "They do not mind the authority of the Raj, nor do they abide by the Forest Rules;" but it appears difficult to eject them. Are they criminal tribes?

Fodder grass is cut and pressed into bales for use in the State stables, and for the Imperial Service troops, but in 1891 they experienced great difficulty in supplying their wants, and had to import grass from Ahmedabad and Alwar.

Two of the range officers were trained at the Dehra Forest School, and a third has since passed successfully through; the Superintendent himself received the Ranger's certificate of the School—in 1882.

The financial results show a surplus of Rs. 14,779, which is an increase on that of the previous year, chiefly owing to exceptional sales of grass.

A. S.

Forest Administration Reports for 1891-92 for the N. W. Provinces & Oudh, Coorg and the Forest Surveys

There is not much for us to say about the Reports for the North-Western Provinces and Oudh. There is a note of dissatisfaction pervading those of all three circles; insufficient staff, frequent transfers, working plans not carried out, demarcation not properly done, excessive privileges and consequent deterioration of the forests, over-grazing and deliberate incendiarism are some of the features of these reports which make it reasonable to think that the forest arrangements are not as satisfactory as they should be, though from the remarks made by Conservators, it would not seem that there is any want of proper agreement between them and the Revenue officers. Probably, the facts are that old arrangements of a period before recent developments of policy came in have become crystallized, and that the greater accuracy in settlement work, working plans and other important matters which is now insisted on (and rightly so) by the Government of India, is difficult to introduce in a province, where so much of the progress made has depended on the necessity for great caution in developing a department which is unpopular with the people and often misunderstood by officials. The most important part of the Review by the Government is para. 4, which we reproduce.

"In paragraph 3 of their letter No. 138 F., dated 5th February 1892, the Government of India asked that in future the reports should contain full information regarding all forest and pasture lands still at the disposal of the State, but not yet brought under the provisions of the Forest Act. The Conservator of the School Circle reports that he has, as yet, been unable to collect the necessary information for his Circle, but promises that the subject shall receive his attention during the present year. In the Central Circle there are approximately 3,428 square miles of forests, the property of the State, not under the charge of the Forest Department. It is not at present deemed necessary or advisable to formally reserve these forests, which are spread over more or less inaccessible hills. It has however been brought to the notice of Government that the forests have in some

'suffered considerably from khil cultivation, and in the interests of the villagers it has been decided to bring portions of those forests, where the results of the fluctuating cultivation have been most serious, under the provisions of Chapter IV of the Forest Act. The rules which it will then be possible to introduce will, it is trusted, suffice to prevent the destruction of the forests actually concerned, and the action taken will serve as a warning to the villages in the rest of the Division, and make the people more amenable to the instructions of the District Magistrate. The Commissioner of Kumaun has still under consideration the list of pattis in which action is most urgently required. The Conservator of the Oudh Circle reports that in the Lucknow and Fyzabad Civil Divisions there are 16 square miles of forests, the property of the State, managed by District Officers. He suggests that these areas should be reserved, but be left under the management of the district authorities. This question will be considered when the report by the Board of Revenue is received on the questions raised in the Circular of the Government of India, No. 17F.-105, dated 15th July 1891, with regard to the classification of waste lands into forests, fuel and fodder reserves and pasture lands. It will then also be possible to give full information as to the waste lands still at the disposal of the State, and to arrive at a decision as to their future treatment."

There can hardly be, in the North-Western Provinces and Oudh, much waste land the property of Government, except in the Hills and the plains district which adjoin them; but it seems to us that what there is ought to be made into permanent estate as was recommended by the Government of India, rather than that it should be treated in half measures under what is, by most people, admitted to be an unsatisfactory Chapter of the Act, that relating to Protected Forests.

The point of greatest interest for our readers in the report of the Central Circle, are those of (1) the natural reproduction of chir in forests open to grazing and (2) the experiments made in the quantities of the yield of 'Katha.' On the former subject it is said:—

"Mr. Hobart-Hampden advances the opinion that the continual restriction of grazing in the chir forests is not a *sine qua non* for effectual natural reproduction, and would merely close such areas as are in the first stages of natural regeneration. This may no doubt be accepted where the system of regular regeneration fellings is in vogue; but where selection fellings are the rule, as at present, the forests are more or less always undergoing regeneration and in all stages. He would, however, establish a system of age classes by the French "*Mode des éclaircies*," but the gist of his remarks lies in the advocacy of grazing after the young growth is sufficiently advanced to be out of danger, as a preventive, or at least a check on the severity of fires, and in this regard the remarks are worthy of attention."

Our own experience points very much to the same conclusion : up to a certain limit, grazing may be beneficial in forests of the long leaved pine, both as allowing the seeds to reach the ground more easily and as diminishing the risk of fire which is absolutely incompatible with proper growth and proper reproduction. It is somewhat strange to find forest officers advocating 'careful firing' under any conditions but this may be seen in the fire report of the School Circle, where however it may also be noted that the Conservator does not agree and apparently holds more nearly the same opinions as Mr. Hobart-Hampden.

The 'Katha' experiments are thus described :—

"Experiments were carried out in the Kumaun Division with a view to ascertain the girth at which the khair tree gives the greatest yield of katha. An area of 64 acres in Guliapani was felled, and the following statement gives the results, which go to show that the smaller the girth the greater the yield, and point to coppice at a young age as the most profitable method of obtaining the raw material :—

Girth in feet.	No. of trees felled.	Cubic feet solid of utilizable portion, including bark & sapwood.	Yield of katha.	Yield per cubic foot.
			Mds. Seers.	Seers.
1½ to 2	150	306	4 25	0·60
2 to 2½	150	478	8 10	0·52
2½ to 3	105	464	6 3	0·52
3 to 4½	73	425	5 8	0·49

"Bark and sapwood not, however, being utilizable in the manufacture of katha, the difference in the yield in favour of smaller trees is actually greater than that shown in the statement. This result, which is entirely opposed to the present idea that trees under three feet in girth are unfit for katha, cannot, however, by any means be accepted as conclusive, and further experiments might well be undertaken, including experiments to ascertain the yield of coppice shoots."

We shall be interested to hear the result of the coppicing of 'Khair,' a tree whose reproduction presents so many points of difficulty. So far as we have seen, in our own experience, khair coppices, if at all, only very badly on the river-bed lands where it is usually found in the Sub-Himalayan Forests.

In the Oudh Circle Report, the most noteworthy matters are, as usual, related to the grazing question. On this Mr. Eardley-Wilmot says :—

"The percentage of divisional areas closed to grazing is too small, and there is apparently no reason why, except in times

of scarcity, grazing should be permitted to any cattle but those the *bonâ fide* property of the tenantry who are resident within such distance as renders the daily journey to and from the forest possible. If this ruling were strictly enforced, the area of the grass lands outside the tree forest would in many places be ample to supply grazing to these herds and tree growth would have some chance of improvement. It was never intended that the State forests should be grazed over by large herds of cattle which are brought from long distances and settle within or in the vicinity of the forests; nor have the privileged villagers the right to collect their cattle at convenient centres from whence to graze over the forest at their pleasure. The department is to blame in having permitted the settlement of outsiders in forests already fully burdened with privileged grazing and also in not insisting on the privileges being administered in the spirit they were granted, which is on the assumption that a grazing ground is of no value if beyond a distance of three miles. The matter can readily be adjusted by defining the forest blocks in which privileges can be enjoyed, a detail which should not have been omitted from the original notification. This question and that of extending the area under tree growth which may be closed to grazing will be referred to the District Officers, one of whom, the Deputy Commissioner of Bahraich, endorses the annual report of his District Forest Officer with the remark that "more forest should be closed to grazing."

And a few paragraphs later he describes the result of protection in the following words:—

"Divisional Officers agree in the excellent natural reproduction present in protected areas and its hopelessness in areas open to fire and grazing. The writer of this report visited the Oudh forests this season after an absence of nearly 12 years and can testify to the excellence of reproduction and growth in those forests which have been rationally treated. Areas which in 1888 were open to grazing and stocked with stagheaded or unhealthy trees springing from a bare and hard soil, are now covered with luxuriant undergrowth of sal and other species, the timely exclusion of cattle having saved such forests to the State; just as the continuance of unlimited grazing in other forests has resulted in further deterioration and must end in their ultimate destruction."

The financial results of work in these Provinces were for the year.

	Rs.
Revenue	17,31,513.
Expenditure	9,55,200.
Surplus	<u>7,76,293.</u>

The outturn of timber was 4,205,000 cubic feet, and that of fuel 7,673,000 cubic feet.

The Report is accompanied by an excellent and useful map of the forests of the Central Circle.

We have read the *Coorg* Report with some sadness. It was the late Mr. Foster's first report and abundantly shews his great interest in the province and its forests and the loss which the Department has sustained in his sad death at Cannanore.

We should have liked to know what the reasons were which led the Chief Commissioner to decide that the *Coorg* forests were not legally 'Reserved forests' under the Act and whether in order to introduce a forest settlement under Chapter II, the old notifications had to be cancelled and new ones issued. However, it can hardly be denied that the new settlement is a great advantage and that it is being speedily carried out. In the work of the year only one claim remained unsettled, a 'right of way,' but for some strange reason or other our Indian Act has no provision for settling claims to 'right of way!' We do not quite understand the system of demarcation by means of 'pits in pairs' and wish some *Coorg* officer would enlighten us. We badly want a general account of the various systems of demarcation practised in India.

Mr. Foster's account of fire-protection will, we think, be read with interest. He says :

"Before giving a detailed account of the fires which have taken place during the past season, I will describe the system of fire protection which has been in force in *Coorg* up to and including 1892. No "fire lines," as so understood in the Central Provinces, were ever made. In the case of exterior fire lines one, and in that of interior, two, "check" lines, a few feet broad, were roughly cleared. The forest in between check lines or between it and the boundary was not touched. Fire was then applied to the intervening growth and what wood, grass or bamboos were combustible were burnt.

'The drawbacks to this system are many. In the first place owing to the standing vegetation being green, much of it fails to burn. Then, as the trees and bamboos are still standing on the so called fire line, it is very soon again covered with a dense carpet of leaves and for the purposes of isolation of the forest from outside fires, is absolutely valueless. As the "line" is covered with trees, bushes and bamboo clumps, it is impossible to sweep these leaves off. They, therefore, have to be burnt, and as the leaf-fall continues all through the year, this burning has to be repeated especially as much of the grass, &c., fails to ignite in the first burning as already stated. Thus, firing the lines in the dry season, when everything round is like tinder and high winds are blowing, lays the forests open to a very great danger, and these fires are all the more liable to get out of hand and spread into the forest inasmuch as, owing to the presence of bamboos and brush wood on the lines, it is impossible to move about and

‘control the fire. Thus many fires are caused by this line-burning getting out of hand.

‘In the Central Provinces, the fire line is always cleared of all trees, bamboos and brush wood. There are two ways of disposing of the grass.—Either two check lines are cut one on each edge of the fire line, the grass thus cut thrown into middle of the line, and then the standing grass burnt—or the grass is cut over the whole breadth of the line and spread out. This latter is the better, through perhaps the more expensive way,—as the cut grass dries quickly and is combustible, while as yet the surrounding forest is green—but under either system the first principle is to have the fire line clear of all tree, bush or bamboo growth.

‘I am now gradually clearing the fire lines. I tried to get them ready before the season of 1892, but was unable to do anything more than a little; owing partly to want of labour and partly, I am sorry to say, to obstruction on the part of my subordinates, but work is going on now and I hope when the time comes to burn the fire lines next season they will be in a proper condition.”

The Government of India, we are glad to see, support the Deputy Conservator in his endeavours to improve the fire-protection work and agree with him that until it is more satisfactory, it will not be politic to relax the rules prohibiting grazing during the hot season, proposing also that where incendiaryism is rife, some really deterrent punishment such as the withdrawal of Rights and Privileges should be applied. We can only regret that it can no longer rest with Mr. Foster to carry out the improvements he has so ably started.

The accounts of natural reproduction in Coorg are as depressing as those of fire-protection, the failure of the latter being the chief cause of that of the former. In regard to artificial reproduction, some interesting notes are given. Sandal sown in pits was not successful and apparently it has been found that, as our own experience bids us agree, sowing in the forest among bushes is more likely to succeed.

Financially, the results of the year were good :— .

	Rs.
Revenue	1,82,897
Expenditure	86,860
Surplus	96,037

The chief feature of the Report of the Forest Survey Branch for the year ending September 30th, 1892 is the series of excellent sketch maps shewing the progress of work in the various and very scattered localities where surveys are going on under Mr. Reynolds' excellent supervision. Bashahr in the Punjab; Raipur, Bhandara and Jabalpur in the Central Provinces; Goalpara in Assam; and Tenasserim in Burma, are the areas in which work was

in progress and in all of them it has been satisfactory, cheap and creditable. The Surveyor General summarises the work done as

Topographical survey	1,586 square miles
Area triangulated	2,357 " "

The cost of the work done came to Rs. 53.4, Rs. 46.9, Rs. 42.3 and Rs. 86 respectively per square mile of 4-inch work in Bashahr, Central Provinces, Assam and Burma respectively; while the 1-inch work in Bashahr came to Rs. 13.7. The total expenditure of the Department came to Rs. 1,24,649.

V.-SHIKAR AND TRAVEL.

Chakla Drogmula.

Perhaps the most picturesque part of the Kashmir plain is the valley of the Lolab or Pohru River; the former name appertaining only to the upper reaches of the river. Immediately below the outlet of the Lolab valley, the tract of land on this river is called the Drogmula Chakla; the principal villages on the left bank being Drogmula itself and Kandi, a few miles lower down, some three miles in a direct line from the river bank. Of all the pretty places in this beautiful country, probably none surpass and few equal those to be found at and around Kandi. The country between the village and the river is gently undulating like many parts of Devonshire; here, a stretch of verdant grass, there a ploughed field; while interspersed are small ravines containing thickets of fruit trees of all kinds such as pear, plum, apple, quince, cherry, hawthorn, etc., all of which are now (May) in full bloom presenting a glorious spectacle of hundreds of trees laden with snowy blossoms. When the fruit is ripe, the bears come from the range above, and, in consequence, all these trees are protected and the place is called a state shikargah. This plain, so to call it, ends almost abruptly at the foot of the range which divides the Lolab from this valley. The elevation of Kandi is somewhere near 5,500 feet, while the range rises to more than 8,000 feet above this. It takes a wide circular sweep from Drogmula, enclosing the Kandi lands, then a point juts out into the plain; again another backward sweep round the village to Túrús till it finally abuts on the river some 3 miles further down at a place called Natanusa. In a recess of the first or Kandi curve, at the very foot of the range, is a most beautiful nook in which is a famous spring known as Ladhu Gunga and here dwell a number of Ladhus; here also

come many others from afar to drink the sacred water. The pool itself is quite a small one, having stone walls on all four sides. Ferns, grasses and flowers grow in the interstices of the stones, while all around are pretty bushes of Parrotia, hawthorn, wild rose, yellow jessamine, etc., and a little above, on a gently sloping bank, stands a magnificent deodar, towering up to perhaps 150 feet above the ground; between the bushes is a lovely green sward covered with wild strawberry and other flowers, the whole forming a peaceful scene of rural beauty that could hardly be surpassed in any country in the world. At about half a mile from this spring, is another of smaller size, known as Narin Nag; this also is protected by a stone wall on all sides, the stones carefully out and laid and of large size. This spring is surrounded by huge poplars, a very fine chinar, and a number of fruit trees, among which is a copse of white-heart cherry trees, perhaps fifty in number; in Kashmir these are called *gildas* and are much prized, the fruit is of excellent flavour but hardly as large as the English cherry. It is my good fortune to be now encamped close to the Ladhu Ganga while engaged in the work of demarcating the forests in this Chakla. I usually start early in the morning and work my way along the edge of the forest, putting up marks which are replaced during the day by posts, supported by dry stone pillars. The work goes on till breakfast time, when usually my wife and daughter bring breakfast to some point agreed on, where I join them; we generally choose a spring or the bank of a pretty rivulet and many a pleasant hour have we spent thus. The little one is allowed, to her great delight, to paddle in the stream as she calls it; and many are the curious things she finds in the water. A few leeches, same beasts exactly like shrimps of small size, curious cricket-like insects and others come waddling out from under the stones as she turns them over. After an hour or so, we return to the tents for the day, till the heat is past, for it can be very warm on a bright day. In the afternoon, if we do not play Badminton, for which we carry the implements with us, we saunter out into the forest and hunt for morels, known here as "guchi" or "kanguchi;" these are very plentiful just now and we eat them in all sorts of ways, as an adjunct to meat and also in the shape of "toasts" and very good they are; there are two kinds, one of which has the head attached to the stalk and the other in which it is free, as in a mushroom, and shaped like a closed umbrella. One day I found *Ophioglossum vulgatum* and on asking a Kashmiri if he had any name for it, he at once said *chouchru*, adding that it was excellent eating boiled like a *sag*. Now, I always try new things that are found in the wilds, for they often stand one in good stead; and this puts me in mind of an incident that once occurred to me. I was at a Mess in the hills and happened to observe that the young fronds of the *Diplazium poly-podioides* (called *Kisor* in Chamba) were very good eating and much resembled spinach; at this several of the young fellows

snorted and one said he never partook of native vegetables, a true British conservative he ! Their Colonel, however, like myself, was in the habit of trying new things, so he and I concocted a mild sell for the youngsters. I left the place next day and shortly after happened to visit a forest near, where I was able to get a good basketful of the young curled heads of the fern ; I sent a man off post haste to the Colonel and awaited results. The sell was a complete one, the fern was prepared like spinach and all the young fellows ate it with gusto, some noticing nothing, others observing they had no idea spinach was to be had so early ; so much for never tasting native vegetables. Some of the *chouchru* were cooked for us by the servant of one of my officers and we found them very good eating, so we turned to collecting ourselves. At first we could find few leaves, but now they are very abundant; our ordinary haul is $1\frac{1}{2}$ lbs. in an hour ; it grows largest in the shade of bushes or tufts of grass and some specimens were 13 inches long, without the roots which are very deep down. I have found this fern in Chamba, but only a few plants here and there, but in this place they are in thousands everywhere. One day, while gathering them, I suddenly came upon what I have been seeking for years, a *Botrychium*, which I once found in Chamba long ago, at least I think it is the same ; leaves very much cut and the fertile spike springing from the base of the sterile portion, neither above nor below. I found two specimens about a foot high, of course quite unripe, spike well developed, and suppose it is *B. virginianum*. As yet all ferns are too soft and unripe to begin collecting, but they are at their most beautiful stage, especially *Adiantum venustum* which is far prettier now in its delicate yellow green stage, than later on when it has ripened into a dark sombre shade. The Ladhus are very friendly ; they are Kashmiri pundits and very quiet and unassuming, we often exchange a greeting with the head man, a smiling genial old gentleman. He one day asked if he might send some cooked vegetables and I assented and shortly afterwards an assortment appeared, in six little brass cups, mostly cooked, (not the cups,) but one cup contained a very tasty little condiment of uncooked green stuff pounded up with milk ; since then he often sends up a supply. They possess many cows and send us delicious milk and we, in turn, give them cream butter which they much appreciate ; they have a garden in which they grow herbs of sorts and I intend giving them some good seeds. They cultivate some land around the spring, but, as they live by charity and have to feed many travellers, the land revenue is paid for them by subscription among the neighbouring lambardars. This is a great place for walking sticks, the barberry (*B. aristata*, I think) is common, and many fine sticks with beautifully streaked bark are to be had, but a straight one, with a really good head, is only to be got now and then and is a great prize. Apparently this is called *chitra* in the Punjab, which is the name

of the *Staphylea Emodi*, which also has a striped bark and probably from this fact, the natives mistake one for the other. The Kashmiri name for the barberry is something like *Lukutsing* but it is hardly possible to render their words in English as the pronunciation is so curious, *ch* being sounded like *s*.—*Cotoneaster* (*lin* or *lin*) is plentiful here but good straight sticks with root heads are few and far between. *Parrotia Jacquemontii* is one of the commonest bushes of the undergrowth, it was in flower early in May. Just now there is a plague of small caterpillars which are a nuisance in the jungle, as the hairs produce a stinging eruption like nettle rash, if they come in contact with the skin. The small red plum called *aleucha* is already of a good size, so it is probable the fruit season will be an early one. The voice of the cuckoo is heard in the land, indeed he calls all day long, the golden oriole has appeared and the long tailed mag-pie is common; there are crows, but he is a very mild bird compared with his impudent brother of the plains; this is a smaller type with a grey head, and his cry is a feeble sort of chirp not the aggravating caw of the other, nor is he in the least a forward bird in his habits.

Near Ladhu Ganga, the spurs of the range slope downwards very sharply into the valley, but near Kandi village the descent, though steep in the upper levels, is a very gentle one lower down, from the edge of the forest through the fields to the flat land below; a horse can be ridden up several of the spurs for a good distance and from here there is a most magnificent view. Let me try to describe it, through word pictures are hardly in my line. The background is formed by the great Punjal Range on the left, and directly in front, the Kazinag peak 14,400 ft., stands out clear against the sky; the summits covered with glittering snow and the base dark with pine forest; nearer, lie range after range of dark blue hills, the beautiful grey mist bathing their feet; nearer still lies the peaceful valley, carpeted with verdant grass and dotted with trees of all the delicate shades of green, while from among them, peep the picturesque farmsteads of the dirty Kashmiri. To the left in the middle distance, several spurs trend gradually down into the valley, their hue the dark and sombre one of the deodar-clad hill; the outline sharply defined against the more distant mountains, while on the right, where the plain is more open, are seen the dark clayey fields, the "bit of colour" dear to the eye of the artist. In the immediate foreground, a little to the right, stands a clump of deodars the branches clear and distinct in every detail, against the setting sun which bathes the scene in golden splendour. "Where every prospect pleases and only man is vile."

J. C. McD.

(To be continued.)

VI-EXTRACTS, NOTES AND QUERIES.

The Forest of Ne-Ha-Sa-NePark in Northern New York.

From a report recently prepared by Mr. Gifford Pinchot, on the condition of a large forest estate in the Adirondacks, we are permitted by the author to print the following extracts, which are of general public interest, as Mr. Pinchot's conclusions and suggestions with regard to the management of the property are applicable to similar forests in many of the Northern States.

"Except for local variations and the greater proportion of the soft timbers in the western and northern part", Mr. Pinchot writes, "forest over the whole park is approximately the same." "The high ground is covered by a magnificent growth of hard-wood timbers, thinly interspersed with spruce. Beech is here the most common tree, with birch and maple closely second. The swamps and low grounds are chiefly occupied by balsam, tamarack, hemlock and white pine. To these, which have been mentioned in the order of frequency, are to be added in the same order, cherry, poplar, cedar and ash. Spruce and pine are at present the most valuable timbers. It seems likely that in future birch will be the most important tree. The silvicultural value of the soil has been reached by the accumulation of mould from the waste of many generations of forest-trees. The ground itself is rocky and not rich, and its sustained vigor depends entirely upon the preservation of the humus or duff, with which it is covered almost everywhere, sometimes to the depth of six feet. Humus disappears gradually upon free exposure to light and air, and may be entirely consumed by forest-fires. Hence fire and reckless cutting are especially destructive to the Adirondack forests, entirely apart from the important loss which they occasion in standing timber and the growth it would have made during the years in which the burnt area is slowly reclothing itself with forest."

Want of space compels us to pass over the description of many of the trees found in the Adirondack forest. Of the white pine, he says that "it grows on the West and South-West slopes of the ridges and on the borders of swamps in mixture with spruce and balsam. It would be exceedingly advisable, however, to defer this removal at least in part, until the reason can be discovered why the enormous number of cones produced by this tree do not result in a plentiful young growth. It is possible that the conditions favourable to the germination

and growth of the pine seed may be found to be producible at very little cost, so that it may be possible to assure a large proportion of this valuable timber in the next crop."

In discussing the age of the trees found in this forest, Mr. Pinchot points to the fact that "young trees are almost always seriously retarded in their growth by the heavy cover of the older specimens. For this reason, the rings of annual growth formed during early life, are much closer together than the later ones. In endeavouring to count the rings of stumps standing on the right-of-way near Lake Lilla, I was often unable to separate those of the first fifty or one hundred years, even with a glass. I found no maple or birch whose inner rings could be counted, and but one beech. This tree was twenty-eight inches in diameter at four feet from the ground, and somewhat over two hundred years old. A hemlock of seventeen inches diameter on the stump was two hundred and ninety two years old. Spruce stumps, on which all the rings were far enough apart to be counted, were also exceptional. One butt log, with a diameter of seventeen inches, was two hundred and eighteen years old. This tree had evidently been stunted by the shade of older hard woods. It is remarkable that the finest spruce, that on the hard-wood ridges, must have passed through this period of repression before making its principal growth. By cutting away the merchantable hard woods, which are suppressing the young spruces over a large portion of the park, their rate of growth may be enormously increased. For example, two young spruces, eight inches in diameter, which had grown among others of the same age, and therefore, with a comparatively abundant supply of light and air, were but fifty-two and sixty years old, although almost twice the diameter of another tree one hundred and twenty one years old.

"The power of natural regeneration of all the trees which I have mentioned, with the single important exception of white pine, seems to be amply sufficient for all the purposes of forest-management. The presence of this reproductive power is of the greatest importance. It puts aside at once the difficulty and expense of planting and insures a steady improvement in the condition and value of the forest.

"The vigorous and abundant young growth makes it possible to remove mature trees without injury to the forest, and under proper handling will insure the continuance of its productive power. The constant character of the forest, even in its changes, lends itself easily to the needs of forestry, while the presence everywhere of mature trees over the young growth makes it possible to cut and yet increase the annual growth of wood from year to year. This steady increase in the value of the forest under forest management is one of the strongest reasons for its introduction. Forest management will add constantly to the proportion of valuable timbers in the forest, by judicious cutting

'without a corresponding abatement in the amount of lumber, produced. In other words, for a few years, the forest will yield slightly more under ordinary lumbering than it will under forest management, because, in the latter case, greater care is used, and many trees which would otherwise fall at once must be allowed to stand. After that time the revenue from forestmanagement will surpass that from lumbering, and will go on increasing indefinitely, while the returns from lumbering methods will as steadily diminish. The profits will certainly pass their lowest point during the first twenty years, and probably during the first ten. Thereafter, they will rise with the rise in prices and the growing productive capacity of the forest. Timber-land as productive as this, as safe from fire, and as accessible to the centres of consumption by rail and water, is, in my judgment, one of the best of long investments".

Mr. Pinchot recommends that this forest should be carefully examined and mapped with a working plan made "with the supposition that it will be best to cut over the same ground a second time at an interval of from twenty five to forty years." Then he would "divide the forests into as many parts as there were years in the period decided on, and assign the land most in need of cutting to the first year, the second to the second year, and so on ; but in such a way as to make the annual production of timber as uniform as possible."

The forest managed in this way is expected "to yield a steady annual return, which ought to constitute a fair rate of interest on the investment," and "to increase the value of the forest by favoring the better kinds of trees, so that the market value of the land, as well as the return from the lumber, would increase steadily from year to year".

In conclusion, Mr. Pinchot discusses *Lumbering versus Forestry* as follows :—"The statement is often made that it is possible to lumber the same land a second and then a third time at intervals of fifteen or twenty years, and get as good a cut from it as at first. In exceptional cases this is true. The probabilities are, however, that the second and third cuts were as good as the first in a pecuniary way, and not otherwise, since during the years which intervened, the diameter of merchantable trees has steadily diminished, while the price of lumber has increased. Forestry provides not merely for sustaining the proportion of the more valuable woods, but for increasing it.

The ordinary methods of lumbering are exceedingly careless of the life of all the young growth which may happen to stand about the old trees. Such carelessness is not only destructive of the future value of the forest, but also increases the danger of fire by the presence of a quantity of dry saplings which forest management would have allowed to grow. Young green trees are the greatest protection a forest can have against the spread of

fire. Hence forest-management tends distinctly to keep fire out, as compared with the methods of ordinary lumbering.

"Lumbering yields a slightly larger revenue than forest-management, but in the end falls far behind it. It increases the danger from fire, tends to deprive the forest of its more valuable timber and lowers its capital value. Forest-management does none of these things".—(*Garden and Forest.*)

Date Planting in Australia.

Information lately received shows that the experiments in tree-planting, in the interior of the colony undertaken by the South Australian Government, have proved successful. A special feature is the splendid condition of the date palm; these trees are already bearing fruit. Some of them were planted by Mr. Ednie Brown, late Director-General of Forests, eight years ago. Such a result is specially satisfactory when it is remembered that it takes longer than the period named for such trees to bear fruit in Egypt and India. The trees were planted at a place called Hergott Springs, situated upon the overland railway line, and were subject to the overflow of a salt-water bore. The fact that these trees will grow in a brackish country is looked upon as important in this country, where so much land is of this nature. Something like 10,000 date seeds have been planted in South Australia by supplying exploring parties with the fruit. It is the intention of the Forest Department of this colony to experiment by sowing the seeds at the different holes which have been carried out by the Water Conservation Department. The experience of South Australia proves that trees will flourish when sown artificially. In some experiments which were carried on at Mount Herbert it has been proved that, upon poor soil, some 350 trees per acre had been reared. With proper application and the selection of suitable trees it would, it is stated, be quite within the bounds of possibility to reforest country which is now quite barren. The experiments made last year upon the commonage at Wilcannia are reported as having succeeded satisfactorily. Notwithstanding that the trees were planted late in the season, and that no rain fell for five months, a very fair percentage of them survived. The planting is to be continued, and something like 10,000 or 15,000 trees will be put out as opportunity offers. Experiments in the same way are also likely to be made at Bourke, Wentworth, and Broken Hill. There are in the state nurseries here some 200,000 trees available for distribution, and the planting of them out can be proceeded with from the present time up to August. (*Pioneer.*)

Planting of the Sandhills on the Sea-coast of Norfolk.

Holkham Sandhills, the property of the Right Honourable the Earl of Leicester, K. G., were rabbit warrens until the year 1850. They extend about three and a half miles along the Norfolk coast, from five to twenty five chains wide, bounded by the German Ocean on the north, and on the south by rich pasture land reclaimed from the sea, dating as far back as 1660, when the first enclosure was made. These hills are held together by a plant called *Psamma arenaria*, which has a strong creeping perennial root, with many tubers at the joints about the size of a pea. It is planted and encouraged on the Norfolk coast to aid in fixing the sand against the action of the wind and tides, which it does in a remarkable manner. The "marrum," as it is locally called, or bent-grass, is considered of so much importance that there are severe laws to prohibit its being destroyed. Mats are made of it, and it is also used as thatch.

Elymus arenarius, the sea lyme-grass, a strong, rough, glaucous plant, common on sandy shores, is also frequent here, and answers the same purpose in fixing the sand as the "marrum." In analysing the soluble matter afforded by this grass, Sir H. Davy found it to contain more than one-third of its weight in sugar. It is not, however, eaten by any of our domestic animals.

About 1850, I sowed several kinds of pine seeds on the sandhills, putting some of the seeds in small pellets of clay and inserting them in the sand, and in various other ways. I did this for two or three years in succession, but it ended in failure. I then planted a few plants of well established *Pinus austriaca*, *P. Laricio* and Scots fir, and had them thoroughly protected from rabbits, never thinking they would do much good in the pure sand, but I was agreeably surprised at the end of the first season. The plants all lived and made one or two inches of young wood, and seemed healthy; the second year they did better, when I drew the Earl of Leicester's attention to the matter, and he was so satisfied with the growth of the trees that were planted that he at once set about destroying the rabbits, and planted a small portion of the hills every year till the whole was completed.

The east end of the hills, nearly two miles in length, which was only partly planted previous to 1875, is a very thrifty young plantation, not only being a shelter for the adjoining pasture, but forming a grand and peculiar feature in the landscape, and the trees doing much better than the most sanguine could expect.

Mr. Munro, the Earl of Leicester's intelligent forester, writes to me about this division of the hills, and says:—"When he came to Holkham in 1877, the trees in many cases were very good, but the tops of the *Pinus Laricio* were very much cut with the northerly winds and blowing sands. He at once commenced planting the tops of the hills, principally with *P. austriaca* and a sprinkling

of *P. austriaca*. When these got hold and began to get up, the *Laricio*, which were cut by wind, began to improve, and by 1882 a very decided improvement was visible. Since then, seeing the progress the plantations made, he went on extending them, until the area planted is now double what it was in 1882."

The proportions in which the plants are used are :—

<i>Pinus Laricio</i> ,	50 per cent.	planted 8 yds. apart.
" <i>austriaca</i> ,	25 "	5 to 7 yds. apart.
" <i>sylvestris</i> ,	20 "	" " "
" <i>maritima</i> ,	5 "	" " "

Let it be distinctly understood that the plantations are ornamental, and are not planted for profit, hence the distance between the trees, giving plenty of room for developing their laterals. The *austriaca* and *maritima*, being on the higher and more exposed situations, and fully exposed to every storm from the German Ocean, are planted 5 to 7 yards apart, as they cannot possibly make the same growth as the *Laricio*, which are more sheltered. The *Laricio* are now in many cases 30 to 35 ft. high, their lateral branches covering an area equal to a circle of 8 yards in diameter, and are full of health. The Scots fir and *austriaca* are making a proportionate growth. When at Holkham last spring, Mr. Munro had just finished planting a large area of the West Sandhills, and, notwithstanding the previous cold and unpropitious winter and spring, I only saw a single dead plant, which reflects great credit on Mr. Munro's management.

Altogether this is a most interesting item in forestry, but I am not aware of any notice of this or similar undertakings having been mentioned in any British work on forestry. Professor Wagner, however, writing to the Prussian Minister of Agriculture, and recommending to him the cultivation of *Lathyrus sylvestris*, a strong perennial-rooted species of the Everlasting Pea tribe, for the immense area of barren sandhills along the coast of Northern Germany, points out that it would form a far superior means for bringing these vast wastes under profitable and permanent cultivation than the planting of pine and fir trees. Little faith was, however, put in that statement, until its correctness had been visibly proved on a large scale by Imperial Privy Councillor of Commerce, Otto Kuchnemann, of Stettin, Pomerania, Germany, who had for many years, and at heavy expense, endeavoured to grow on his sandhills pine and fir trees, but had failed to succeed, the young trees being partly smothered or uprooted by the evershifting sand, and those surviving were vegetating so weakly that the attempt was tantamount to failure. Now a flock of sheep is kept on the *Lathyrus* fodder grown on the identical sandhills where six years ago not a blade of grass could be seen—**ARCHIBALD GOBBIE**, in the *Transactions of the Royal Scottish Arboricultural Society*.—(*Timber Trades Journal*.)

VII.—TIMBER AND PRODUCE TRADE.

Churchill and Sim's Circular.

JUNE 5th 1893.

EAST INDIA TEAK.—The deliveries for the first five months of this year have been 5,307 load againsts 4,269 loads for the corresponding periods of 1892 and 1891 respectively. In May this year the delivery has been 1,444 loads : in May 1892, it was 1891 loads, and in May, 1891, 1,208 loads. The stock has been reduced and that is so far good, but there has been no change in prices, as these deliveries are still due to the fact of an unusual proportion of the regular Navy requirements being taken from London under contracts arranged and discounted some time back. They do not therefore now affect the general market.

ROSEWOOD is inactive, therefore stocks though not excessive are sufficient.

SATINWOOD. Finely figured *logs*, of good sizes, would sell well, but for small plain logs, and for *planks* and *boards* there is no demand.

EBONY Considerable sales have been made, but were only possible at low prices.

PRICE CURRENT.

Teak	per load	£9	to	£15
Satinwood	„ ton		o	£ 12
Rosewood	„ „	£5	to	£9
Ebony	„ „	£5	to	£7

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[No. 8.

A tour in Jaunsar.

BODYAR FOREST. April 21st to 26th.

This forest, which has an area of 1,463 acres, has been protected from fire since 1872. Owing to its proximity to the villages below Chakrata, heavy demands were made on it before it came into the hands of the Forest Department, and in 1869, when Chakrata was built, a good deal of timber was taken out. The consequence is that the large deodar trees are far apart and are quite unfit for sleepers, being covered with branches; but there is a young forest of poles coming on which will in course of time be exceedingly valuable.

The first sowings in Bodyar were made in 1872, seed being sown in drills close to the bungalow, and superfluous plants put out into blanks. The present average height of these plants is 18 feet (88 trees measured).

In 1875, nurseries were formed in various sheltered places. We visited one of these situated below the bungalow to the west of the path leading down the spur. Several deodar plants were left in this nursery and they now form a complete canopy; the lower branches have died and were pruned off in 1892 by the students, and the height of the dominant trees is now over 30 feet. "

Measurements taken at different times in this old nursery are as follows :—

April, 1886,	Average height		8 ft. 2 in.
May, 1887,	" "		11 ft. 5 in.
April, 1888,	" "	(24 plants)	13 ft. 0 in.
" 1892,	" "	(27 plants)	21 ft. 0 in.
" 1893,	" "	(13 plants)	30 ft. 7 in.

This excellent growth is due to the good soil and sheltered position, and to the roots remaining undisturbed.

The plantation formed by plants from this nursery is No. 7 of 1878, situated in compt. 4, to the east of the path. The aspect is south-east, as a rule, and the soil is rocky and shallow. The plants are yellow, and the progress made has been slow. In May, 1887, the height was 3 ft. 8 in.; in April, 1888, the average of 25 plants was 4 ft. 2 in.; in 1893, the height of 333 plants was 6 ft. 9 in.; the average length of last year's shoot was 6 ins., but it varied from .3 ins. to 15 ins. according to soil, aspect, &c. Blue pine was sown in patches between the deodar some 6 or 7 years ago, and is now growing strongly with more than one plant in each patch; there are however many gaps.

From this plantation we descended to the Bodyar fields, and went up to Bangialani dhar, through compartment 1, and a series of old patch sowings of 1877 and 1878. Generally speaking, blue pine and deodar were sown in patches, and in several of them there are 4 to 5 plants, but there are many blanks, and the crop is nowhere continuous. In favourable aspects, the height of the taller deodar is 15 to 18 ft. and that of the blue pine some four to five feet higher. The following account of these sowings was given in the Journal of 1888 :—

“ We inspected various sowings of 1877 and 1878 along the path to Bangia Lani; deodar and blue pine were sown in patches, every fourth patch being sown with the latter; the average height of 84 deodar was 4 feet 4½ inches; the average height of 31 blue pine was 6 feet 4 inches; these were situated below the path, and it is believed they were sown in 1877.

“ The slopes above the path were sown in December, 1878, and here the average height of 88 deodars was 4 feet 7 inches, and the average of 29 blue pine, 5 feet 11 inches.

“ The aspect where these sowings have succeeded best is north-west, and the soil deep and good; on this aspect young deodars did not present that yellow appearance which we noticed in the plantation of 1878 on the southerly aspect.”

The heavy snow of the past winter which drifted over the ridge and was still lying in deep masses at the time of our visit, has done an immense amount of damage to the young plants, smashing them completely in several instances, up-rooting and bending down others. In cases where the plant is broken in two, it would be advisable to lop off the broken part just above a verticel, and trust to one of the side branches forming a leader. Plants that are merely bent down might be supported from underneath by a forked stick.

In 1892, we found the average height of 82 deodar to be 10 ft., of 23 spruce fir (also sown there) 6 ft. 8 in.; and that of 30 blue pine 12 ft. In the lower portion below the path, the deodar shewed a height of 10 ft. 8 in.; and blue pine 16 ft.

We examined the matted state of the grass in this portion of Bodyar, and the difficulty of natural reproduction by seed under such circumstances was clearly explained. Natural reproduction

of pine and deodar rarely takes place under such conditions, but only when the grass is quite short and the rootlets of the germinating seed can reach the soil ; the best examples of all are recently abandoned fields as at Koti Kanasar. But the preservation of the grass for 20 years has resulted in a fair amount of vegetable mould, and in all patch sowing, or pit planting here, the black soil clinging to the roots of the grass should be well beaten out and mixed with the soil in each case.

The cones of deodar, blue pine, and spruce fir were shown to the students and the different manner in which the seed is dispersed was explained. The two former trees are the best for re-sowing blank slopes.

On the way back, we passed through the thicket of deodar mentioned in the Journal of 1888, as follows :—

“ On the road to camp, we examined a large patch of natural deodar which has sprung up in some old fields abandoned about 19 or 20 years ago ; the aspect of this slope is north, and the crop of deodar is so dense that it is difficult to make one's way through it. This is an absolute proof, if any were needed, that deodar will prosper in good soil and on a favourable aspect without any protection overhead.”

Since then several of the fir have been girdled and the lower branches of the deodar pruned. Some of the fir girdled two years ago are still alive, generally the larger ones. For facility of moving about inside this thicket the suppressed trees might be removed, and the lower branches pruned off ; this would facilitate the inspection and study of this interesting young crop ; but it must be remembered that over large areas of an almost pure crop such as this is, the removal of suppressed trees is not advisable, first of all on account of the expense—the produce not being saleable—secondly, they are of great assistance in helping to form clean boles.

On the way back to camp we passed some deodar poles marked for sale to the Sappers and Miners. This is an instance of a true thinning, and the object of such an operation and the manner of carrying it out were explained to the students. The leaf canopy would not be interrupted by this thinning, and yet the dominant trees would have more space given to their crowns to increase laterally. A better example than this could scarcely be found.

April 21st. We inspected plantation No. 1 of 1881. It is situated in Ganwa, Compartment 7 (c) of Working Plan, and was raised from seed sown in December, 1878. Some of the plants in the Bodyar nursery were pricked out into beds with a hard bottom, others were raised in ordinary beds in Ganwa. For some years a difference was noticeable between the growth of these two series of plants, and in 1891, it was found that the average height of the plants raised on hard bottoms was about 10 inches more than the ordinary plants. We did not however observe an appreciable difference between the plants and did not take separate measurements.

In 1891, the average height of 320 plants was 4 ft. 2 in. ; and in 1893 we found the average height of 152 plants to be 4 ft. 11 in.

The aspect of this plantation is E. N. E. and the slope 35°. The plants out in the open are looking yellow. We measured the height of 11 plants growing under the shelter of a large blue pine, and found the average to be 6 ft. 9 in., thus shewing the beneficial influence of side shelter. These plants were hoed in August, 1892, and the grass quite cleared round their roots, and it remains to be seen what effect, if any, this operation will have on their growth. This loosening of the soil, immediately before such an exceptionally severe winter has undoubtedly allowed the snow to bend down the plants more than it otherwise would have done ; but this of course could not have been foreseen and in ordinary years the operation would have been most useful.

On the 25th April, we examined plantation No. 8 of 1878. It is situated above the Ganwa path and on the western side of the first large ridge going from the Bungalow (Compartment 4 of Working Plan). 1,131 deodar plants were measured and gave an average height of 9 feet. One plant had an annual shoot of 29 inches. On the whole the progress made has been slow, and the plants are yellow.

Plantation No. 3 of 1879 is situated just below this, between the upper and lower Ganwa paths :—918 deodar growing on the westerly aspect had an average height of 9 ft. 6 in. ; while 62 plants growing on a southern aspect shewed an average height of 6 ft. 6 in. The minimum was 3 ft. and the maximum 30 ft. Lower down blue pine has been sown in patches, and is now 6 or 7 years old with an average height of 4 ft. 6 in. (440 measured).

Near the landslip, 93 deodars gave an average height of 14 ft. 10 in.

Both these plantations were raised from seed of 1875, sown in the Bodyar nurseries ; in the upper plantation, the plants were 2 years old when put out in July, and in the lower one, 3 years old.

Strip sowing of Blue pine in Ganwa.

In Compartment 7 (a), over an area of 28½ acres, strips running in contour line were hoed up last year, and all grass roots removed. The strips are 2 ft. and 4 ft. wide alternately and the uncultivated belts between are about 3 ft. wide. The aspect is easterly as a rule and the soil very poor. Blue pine seed was dibbled in, in June, and again sown broadcast and trodden in with the foot in July. Countings on a portion of these strips were conducted as follows ;—a rod 4 ft. long was laid along the strip and the number of seedlings counted in this length ; if a seedling was found in the length of 4 ft. it was counted as a success.

The results were as follows :—5,143 four-foot lengths were counted : of these 3,663 were blank, and 1480 had seedlings in

them, to the aggregate number of 2,390. Hence the percentage of success is 28·8, and of failure 71·2. The soil is of a bad quality and the situation is dry, hot, and exposed, and it is to be feared that some of the existing seedlings will die. In December, grass was placed over the young plants as a protection but several have since died notwithstanding this precaution.

Blue pine has numerous enemies to contend with, when sown in the open. Birds eat the seed, grubs cut through the roots, and later on a beetle attacks the leaves.

It is intended to plant deodar along these strips at intervals of 10 or 12 feet, the idea being that the pine will grow up faster and act as a nurse; a commencement has already been made in this respect, and about 1,700 plants have been put out. In the lower portion of this area, cuttings of willow and poplar have been used to mark the planting spots and nearly all of them have struck root and are sending out young leaves. If these cuttings should survive, it might be advisable to make an experiment on a larger scale, as if willow and poplar could be got to grow, it is possible that the problem of a nurse for the deodar might be solved. Any how the experiment would not cost much, and it is well worth trying.

The experience of 18 years in Bodyar has clearly proved that on the drier and hotter slopes, it is essential to raise some crop as a nurse first of all, and blue pine would appear to be the best for this purpose. Indigofera and other woody shrubs answer very well, but as a rule they only grow in good soil, sheltered ravines, &c. There are, scattered about Bodyar, some blue pine trees, self sown, dating from the commencement of fire-conservancy in 1872. There are not many of them, and no parent trees are visible in the area; but the seed has been brought by the wind possibly from the heights of Moila, or by the agency of birds; plants have sprung up, and there are now several trees, 21 years old, with an average height of 24 feet, and girth of 21 inches (16 trees measured). They have already begun to shed seed, and from observations made, it is believed this seed is fertile, and a second crop is now being gradually produced on the ground. Had there been many more of them it would have been possible to underplant deodar before this, with every chance of success. The instance mentioned above of a solitary pine sheltering 11 deodar plants and giving them two feet in height above those in the open sufficiently proves this.

We also examined some sowing (July 1892) of blue pine in roughly made patches on two slopes in Ganwa. On a southerly aspect, 3,010 patches contained 1,371 blanks, and 169 patches with seedlings in them to the number of 3,973; percentage of success is 54·5, and of failure 45·5. The average number of seedlings is 2·4 per successful patch.

On a westerly aspect, but on a much steeper slope, 847 patches contained 397 blanks and 450 successful patches with 946 seedlings in them, giving a percentage of success 58, and of failure 42.

The average number of seedlings is 2·1 per successful patch.

Besides general inspection of the forest and measurements of the various plantations as given above, the following works were done by the students :—

307 basketted plants were put out in prepared pits in Ganwa, Sub-Compartment 7. (a) and (d).

513 patches were sown with deodar seed and several contour lines were laid out for strip sowing. Last autumn the ground had been cleared and lightly hoed up under two deodar seed bearers near the Forest Chauki, and the number of seedlings that had come up were counted. Under the first tree, belts 10 ft. wide were counted separately ; the first just above the tree contained 3 seedlings ; the second one with the tree in it, contained 18 ; then in descending order 21, 6, 5, 3, 0, 0, 0.

Under the second tree, belts six feet wide were examined ; the one immediately above the tree had 285 seedlings ; the one containing the tree had 920 ; and the three next belts below, 701, 318, and 45 respectively. This small experiment shows that deodar seed is not carried far by the wind ; generally we noticed seedlings underneath the parent tree and not out in the open at any distance.

As mentioned above, snow has done an immense amount of damage this year, a portion of a well stocked slope in the lower part of Ganwa, about one acre in area, has been shaved clean off, leaving the underlying rock quite bare. The uprooted saplings might be transplanted into large pits. All over Bodyar, plants have been bent down, through an angle which varies from 40 degrees to 80 degrees. It will be interesting to note in future years if they regain an erect position.

A small insect, probably a *Chermes*, produces a gall at the ends of the branches of spruce fir ; the bud becomes arrested in growth, thick and fleshy with scale-like leaves ; inside, around the edges, may be observed numerous minute pink grubs, which eventually develop into flies and leave the small cone-like bud through a series of apertures. This year, we noticed very few of such galls, but in ordinary years they are quite common.

A fungus, *Ecclidium Thomsoni*, also attacks the ends of the side branches in the spruce fir producing pretty yellow tassels, which turn deep orange, then red, and then black, when they dry and fall off. Neither the insect or the fungus appear to do much harm, and they do not attack, as a rule, the leading shoots.

Excursion to Moila. On the way we noticed an abandoned deodar nursery in a damp ravine shut in by trees. Such places are exposed to frost, and the elevation being 8,000 feet which is too high for a deodar nursery, the site was wisely abandoned.

The boundary pillars of Bodyar forest are made of dry rubble masonry 4 ft. cube on a plinth 5' x 5' x 1'. The wooden post bearing the number is fastened to a cross piece embedded in the masonry to prevent its being pulled out. These pillars are unnecessarily large, costing Rs. 3-8-0 each.

From the top of Moila peak which is 9,058 ft. above the sea, there is a grand panorama of the country round on all sides. To the south we have the compact Bodyar forest enclosed in an amphitheatre and looking from here particularly well stocked as we could not see the bare southern aspects; the fire line on which we were standing could be traced nearly the whole way round. To the west, we have the Chor Mountain nearly 12,000 ft. high and covered with forest except on the very summit, then more to the north, the high peaks of Chachpur and Kuphar, over 10,000 ft. and covered with *Karshu* Oak and the white birch to the top. The Pabar and Tons valleys were visible for miles, and in the distance the leased forests of Lambatach and Deota could be made out, the horizon for more than 100 miles on the north being bounded by the snowy range, conspicuous in which rose the peaks of Bunderpunch, commonly known as Jumnotri.

The grassy top of Moila itself is a high level grazing ground for the sheep and goats of the neighbouring villages, and their camping places in small hollows are common everywhere, with the piles of stones on which they keep fire burning all night to scare off leopards. On the north side of Moila we went down through the second class forest of Missau. It is open to grazing, and closed to fire, and the reproduction is on the whole very good. Here and there, the sheep and goats nibble the young conifers, and reduce them to the state of stunted bushes, described in the Journal of 1888, as follows:—

“ We then passed through some forest near Kophti open to grazing, and on the bare grassy slopes we found that the conifers are regularly browsed by sheep and goats. The appearance presented by the deodar, blue pine, and spruce fir when thus treated is remarkable; they resemble short squat bushes, much broader than high, with innumerable little branches and twigs; those we saw were about one foot high with a thick carrot-like root and, judging from the annual rings, 10 to 12 years' old. We were not able to determine satisfactorily at what time of the year this damage is done, but believe it to take place during the late autumn or early winter, when the grass is killed by the early frost; the conifers are probably also browsed when snow is on the ground.”

It is stated by the local Forest guards that this browsing takes place in the summer when the sheep and goats first come up, and the young needles are fresh and juicy.

But this grazing is not very extensive except in the immediate neighbourhood of the camping grounds, and wherever there is a sufficient number of seedlings on the ground the young plants gradually grow up and form thickets, notably in the case of the blue pine. The great difference in the reproduction between the Bodyar forest with its hot dry slopes and thick matted grass, and that in the Missau Forest is most striking and the principal reasons for this will be given hereafter.

(To be continued.)

" Protected Forests."

In the April number of the *Indian Forester* an article headed "A plea for Protected Forests" has appeared; and though the article is both interesting and in the main justly supports the point contended for, it has I think somewhat missed the real objection to the provisions as they stand in Act. VII of 1878, regarding Protected Forests, and also is calculated to give rise to some misapprehension of what the law really is. It was no part of my intention in the *Manual* (and this will I hope be still clearer in my shortly forthcoming "Lectures on Forest Law") to object to making legal provision for the protection of lands which, under the circumstances, it is not worth while to treat under Chapter II. If lands are liable to be washed away (and such lands seem to be mostly in the contemplation of the writer in the April Number) it is not likely that there will be any extensive *rights of user* in them and that alone would justify their being placed under a system less complete than Chapter I describes. But even so, the procedure under Chapter II would be very easy when there are no rights, for it is then very much a matter of form.

It has always been contemplated (vide the Burma Act, XIX of 1881) that there should be legal provision for the protection of forest and waste lands which (for any cause) it is not desirable to demarcate and settle expensively. The cases in which such provisions can be carefully applied are chiefly: (1) where the conditions are undeveloped, and it is not certain whether the area is really wanted as permanent forest, or whether it had not better be (ultimately) given up to cultivation; (2) where there are no rights of any kind, so that there is really no need of any action but clear demarcation, and an announcement of the public right and public control of the area, so that new comers and others in future may not imagine that the area is "no man's land" and available for them to do what they like with; (3) where there are such complications that some kind of protection, however imperfect, is better than none. And I may now add such a case as that now put forward—riverain forests where the alluvial area is liable to constant change.

But the objection to Chapter IV. is its *general* principle; that it appears to allow the forests permanently required by all social, economical and climatic conditions and possibly burdened with rights, to be called "Protected Forests"—although none of the essential elements of a really definite security of the area as *State property* (for the public benefit,) are provided.

Chapter II alone represents the conditions under which a forest permanently wanted for the good of the country can be fully and legally established. The whole question depends on the existence of rights (or long standing practices which are equitably

regarded as rights). All waste land belongs in theory to the State, this being one of the most ancient land rights known in India. But time, neglect, and many other circumstances have brought about a state of things in which the rights of the State have been mixed up (so to speak,) with what have become (or are allowed to be) the prescriptive rights of villages or private persons.

These are vague and indefinite in most cases. If there are no rights, no questions to be adjusted, then of course there is no serious difficulty about the procedure, even that under Chapter II becomes short and easy. But when the forest is very much needed by the people, and therefore numerous demands for grazing, wood-cutting and other rights have grown up there, it is evident that we want a permanence of the forest area, and its cultivation in such a way as to secure continued productiveness—its always going on fulfilling its useful functions; and *that* in the long run will *not* be done if rights are not settled, if vague claims are not defined, and if it is uncertain what rights Government has and what rights other people have, and are still acquiring, by lapse of time. Chapter IV, it is evident (on an analysis of it) does *not* effect this: I cannot weary you by going into the whole case, but permit me to remind you that, in ninety-nine cases out of a hundred, what is wanted is not the knowledge (a record) that some person or persons has a general unlimited right of 'grazing' (—anything and everything at any time) or of 'woodcutting', but a power to decide: to say as a Settlement Officer, 'I admit as a fair representation of what this man, or this farm really needs, and what his (or its) equitably acknowledged right ought to be, that he can graze so many cows and oxen, so many sheep, (or whatever it is) in certain months, and under certain conditions, which are needed for the safety of the estate.' Without that however, a mere enquiry and record of rights such as Sec. 28 vaguely prescribes is of no use to the forest, and very little to the rightholders. Admittedly then, an officer could be appointed to make such an enquiry (which may be conceded by a process of inference, but no power exists to enable the officer to define or *decide* anything, nor is there any appeal against a decision if one could be given. The powers cannot be conferred by Rules* for it is an obvious principle that Rules may fill in details, but cannot be used to extend the scope of an Act, and convey distinct powers, which the Act itself does not give, and indeed rather pointedly omits. The whole difficulty was, that the Committee who revised the draft Act did not understand the subject, and they insisted on putting in Sec. 28, *not* to protect the forest, but to protect the right-holders against the wicked and grasping Forest Officer! They perceived that they must leave it vague, for if they provided the

* I must here point out that Section 71 is no help, no power of decision is given.

necessary apparatus of letting there be a regular officer, with power to decide and to define, and with an appeal against his order, what would become of the difference between Chapter II and Chapter IV (as altered by them)? The framers of the Act as it originally stood, always intended that, when for some reason a complete and permanent settlement was not desirable or possible, protection should be given by certain provisions, but that *no attempt* should be made to do the work of settlement, *i.e.* to define and record rights. It was always intended, that if anyone were prosecuted (which practically would rarely happen,) and be set up as a plea—"I did this because I had a right"—the plea should (if fairly probable or established,) be an entirely sufficient answer. The whole objection to Chapter IV, then, is *not* that such a chapter properly drafted is not useful in certain cases, but that an important and inconclusive procedure should not (merely to save trouble and expense,) be applied to forests in which *rights* ought to be settled once for all : and there is an obvious temptation to save trouble by declaring forests ' Protected ' which, if they are in the midst of a large population and much utilized by right-holders, will—as certainly as anything can in this world be predicted—slowly but surely deteriorate and finally disappear altogether. There ought to be only *one* class of forest regularly and sufficiently established to secure its *area* from being frittered away, and its *management*, being such as will enable the productiveness—for *whatever is wanted*, whether large timber for D. P. W. or small stuff, or grazing for the villages—to be sustained.

In a "protected" forest, new rights may always be growing up unless extraordinary care is taken, and if it is once admitted that one person or another has some kind of grazing, wood-cutting or other right, it is impossible for any one to fix 'how much' or 'how many' or any other feature of the rights which is at present uncertain.

I do not know where the writer gets the idea that in a regular forest, work cannot be done till settlement is over, while it can in the other case. Certainly the Act contains no such provisions. The forest being proposed to be "reserved" is necessarily, to some extent, the property of Government ; and neither wood-cutting, nor private grazing (as it exists,) need stop for the settlement. All that is legally required is that fresh attacks on the soil (clearings,) should not be made *so as to introduce* fresh complications of ownership : also that new rights should not go on growing up or that rights as yet unestablished should complete a term of years by prescription. But Government is not obliged to suspend its work if any is going on, any more than a person having a plot of land in the forest would be obliged to cease cutting his crop or weeding the field ; nor would existing grazing be stopped. The whole question I may repeat, is one of the existence of rights: these, if not settled, have an awkward way of growing and spreading till in the end the attempt to contest the forest is given up. There cannot be two ways of

securing an area as a *public estate for all time*. For if one of the ways legally effects the object, the other must be superfluous. There can only be one class of legally secure forests; there may be other areas which though confessedly not secure, are placed under a certain degree of protection. It is a matter of local convenience and of a consideration of all the probabilities of the future to determine whether a secure forest-property should be constituted. The danger is to suppose, that with forest really wanted, whether by the local population, or by the State for valuable timber, you can shirk the really needed elements of legal and final security under Chapter II, by resorting to a (supposed) *other form of permanent forest*, which is really not satisfactory. Can any one point to a single 'Protected Forest' in India which *is* burdened with rights and which ought to be secure for all time, that has had the rights defined so that they cannot grow, and that is so ordered that new rights cannot arise in it? The record made under section 28 can have no other effect than that of informing Government that a number of rights either really exist or are claimed, so the Government may, if it thinks rights are numerous, *decline* to allow the forest to be gazetted. That is really the sole object and intention of the alteration. It will be remembered that in 1878 at any rate, the one (inveterate) idea prevailing in official circles was, that if a forest was much overrun by the grazing and other requirements of neighbouring villages, the one and only thing to do, was to *give it up*, without control, to the villages, and abstain from including it in the list of Government forests altogether. It is supposed that somehow it would go on (at least for immeasurably long time), supplying what the villages wanted, without any care or cultivation. At best, it was vaguely dreamed, that in time, the villagers might be induced to do something of their own accord to adopt measures of reproduction.

The securing of area and the settlement of rights is, if anything, *more* wanted in forests very much in demand for satisfying village requirements, than it is in forests which are valuable to the State as "nurseries for gigantic teak trees."

I trust that these remarks will not be taken as ill-natured or as carping at a useful and clearly stated paper of criticism. On the contrary, the appearance of such a paper ought to be hailed with the greatest satisfaction. Nothing will be more conducive to the establishment of sound ideas of Forest law in practice, than the ventilation of the whole subject and the examination of specific cases in the lights of legal principles and provisions of the Acts, such as have been, I think almost for the first time, done in the paper on which I have been remarking.

B. H. B. P.

Oxford. May, 1893.

The Revenue of the Prussian State Forests.

The annexed diagram with the following remarks taken from the *Forst und Jagd Zeitung* may be of interest to foresters.

The area of the State Forests of Prussia is about $2\frac{1}{2}$ million hectares or, say, 6,175,000 acres. The expenditure amounts to about 50 per cent. of the gross revenue: the net surplus during the last 20 years has varied between 22 and 28 million marks, but in the last two years has reached 35 million marks.

During the past 25 years, the gross revenue has risen from 44 to 73 million marks and 10 millions of this increase has taken place in the last 2 or 3 years.

The increase in area during this period has been about 4 per cent. but about the same area has been removed from State forest in the extinction of rights and whilst the area given was stocked with good forest, that acquired is either unstocked or contains only young growth.

The average sale price of the outturn has not increased; the outturn however has increased from 7 to nearly 10 millions cubic metres.

The conclusions arrived at are that, the selling price being constant, the yield and the gross revenue have increased by $\frac{1}{3}$ rd, whilst the expenditure and the net revenue still retain the same proportion *viz.*, 50 per cent. of the gross income. The net revenue per hectare, *viz.*, from 9 to 13 marks, is twice, in some cases thrice, more in other states of the German empire, but experienced foresters have doubts whether this high revenue is not exacted at the cost of the future and at any rate a high surplus is dependent on so many circumstances that it is by itself no criterion of the skill and knowledge of the Forest Officer. The increase in gross revenue in the last few years is entirely due to more extensive fellings but it is not shown whether this increase in outturn is justified by an increase increment and therefore whether or not the future revenue of the forests is injuriously affected. It is easy to increase the gross revenue from a forest by more extensive or intensive fellings, but the aim of the Forest Officer should be not to fell more trees but to grow more and better timber.

S. E—W.

Forests Versus Insects.

It is not only in the cases which attract general notice, as in that of the sal trees in Assam which are said to have been completely defoliated throughout two hundred miles of Forest in 1878, or in that of the teak plantations in Lower Burma which have recently been attacked by an insect reported as doing as much or more damage than an ordinary forest fire, that injury is occasioned

to forests by insects in India. For damage is constantly going on almost unnoticed upon a scale which interferes to a serious extent with the operations of the Forest Department. For proof one need go no further from the Forest School than the nearest highway, where nine-tenths of the young ~~tree~~ ^{trees} that line the road are stunted and their value as timber greatly reduced by the *toon* borer, which destroys the leading shoots almost as fast as they are put forth. Again, a walk down the Dehra Canal road brings one to splendid clumps of bamboos whose value must be lowered in a very great degree by the tiny borer which so frequently reduces dry bamboos to powder. But it is useless to multiply instances, for throughout the whole period of the growth of almost every forest tree in India, from the seed which is likely as not to be destroyed by weevil, to the timber which is liable to be eventually eaten by white ants, there is hardly a moment when it is not to some extent subject to attack from one kind of insect or another.

Something can no doubt occasionally be done, when the damage is noticed, but in the great majority of cases, curative measures are too costly for every day adoption in the forest. The question therefore of the general measures which are practicable for reducing liability to attack is of very great importance. The subject is one upon which the entomologist by himself is unable to express an authoritative opinion, for the matter largely depends upon practical considerations which the executive forest officer is alone in a position to weigh.

The majority of destructive forest insects are said to be continuously present in greater or smaller numbers in the forest. Under ordinary circumstances they are kept down by natural enemies and disease, but they are always liable to increase. A hundred eggs is by no means a large number to be laid by a single insect, and as, in the majority of cases, several generations can be gone through in one year, multiplication is excessively rapid, whenever abundance of food and absence of natural enemies and disease happen to occur in conjunction with weather that is favourable to the development of the species.

The presence of dead and dying wood in a forest undoubtedly tends to promote the multiplication of boring insects of all kinds. This is particularly the case with bark borers which often do a great deal of damage. Again, fallen leaves and litter, when left upon the ground, serve to shelter the pupæ of such insects as the destructive Teak *Hyblaea* from the birds which would otherwise destroy them. Before systematic protection was organized, forest fires probably served to some extent to clear the ground of litter, though the service thus rendered was much more than compensated for, even so far as insects were concerned, by injury to the vitality of the trees, resulting in the multiplication of boring insects. In forests that are protected from fire, and where the litter is not removed artificially, white ants are believed to be about the most important agents for converting dead wood into valuable soil.

Against this must be balanced the damage these insects occasionally do to freshly planted trees, and their ravages in dry timber and other substances not intended for the entertainment of Termites. If white ants could be extirpated elsewhere it would no doubt be most injurious to encourage them in the forest, but this not being the case it may very possibly prove that the protection of their nests is in many cases beneficial upon the whole, as tending very materially to reduce the amount of dead wood and litter of all kinds. The actual removal of dead wood and litter from the forest is no doubt most desirable wherever it is practicable, but the question of when this is the case must depend very largely upon local conditions. In any case, the removal of the leaves, though desirable from an entomological point of view, is not likely to be approved by the forester who considers them useful in other ways to the trees. When it is impossible to remove dead wood altogether, stripping off the bark and burning it is the next best thing, as wood is much less liable to harbour injurious insects when deprived of its bark. Prolonged immersion of timber in water is also said to be useful for the same purpose and is already largely utilized in the case of bamboos, though it is difficult to say to what extent it is to be recommended unconditionally for other timber.

Another feature of general importance is the fact that almost every destructive insect prefers some particular species of tree for its food, though it may also attack other trees to a smaller extent. A forest therefore which consist of a mixed assortment of different kinds of trees offers less opportunity for wide-spread injury than one which consists chiefly of single species. For the trees which are not liable to attack from the particular insect which happens to be in the ascendant, not only escape themselves but also tend to confine damage to the spot where it originally started. This fact has been largely taken advantage of within the last few years in the case of the destructive *nun* caterpillars in the forests of Central Europe where belts were formed round infested areas by clearing away the spruce undergrowth which was found to be chiefly liable to attack.

Again, the importance of protecting insectivorous animals of all kinds, and especially insectivorous birds, is very generally appreciated. The number of destructive insects destroyed by birds in India is believed to be stupendous, (1) and it is most desirable to afford every possible protection to the species that are of use. Care however should be taken to discriminate between such habitually insectivorous birds as the ground thrush (*Pitta*), which may be looked upon as purely beneficial, and such species as the rosy pastor starling (*Pastor roseus*) which is said to do more harm in devouring seed than good in eating up insects.

(1) Major Bingham writes with regard to the destructive Teak *Hyblaea* in Burma, that a plantation attacked by this insect is a wonderful scene of activity, as numbers of Jungle fowl, ground thrushes (*Pitta*) and insectivorous birds of all kinds crowd to the spot to feed upon the caterpillars.

We have seen that the multiplication of destructive pests depends to an enormous extent upon the presence or absence of parasitic and predaceous insects and of disease. These are elements of the very greatest importance and deserve careful consideration, though comparatively little has been ascertained upon the subject in India. Extensive experiments, in some cases attended with promising results, are being conducted in different parts of the world in connection with the possibility of controlling them artificially. The matter may not improbably become of immense practical importance hereafter, and in any case should prove most interesting for forest officers to study, though it has not yet advanced to the stage of immediate utility.

CALCUTTA,
19th May 1893. }

E. C. COTES.

Obituary, E. J. N. James.

We regret to hear of the death at Chittagong of Mr. E. J. N. James, Extra-Assistant Conservator of Forests, Bengal. Mr. James was an Eurasian. He joined the Department as a probationary Sub-Assistant Conservator, in December, 1886. After following the course of instruction at Dehra Dun, he obtained the Ranger's Certificate in July, 1889, passing "with honours" in Mathematics and Forest Law, and was appointed a Sub-Assistant Conservator, 3rd grade. At the time of this death Mr. James was an Extra-Assistant Conservator of the 3rd grade.

Mr. James was of a quiet and retiring disposition, steady and hard-working, and always ready to undertake cheerfully whatever work was entrusted to him. He was generally known as one of the best Officers of the Provincial Forest Service.

II.—CORRESPONDANCE.

A 'Bureau de Recherches.'

SIR,

Every one is agreed that much energy is wasted in India by officers laboriously working out questions which perhaps have been already definitely settled elsewhere, and although to some extent this can be avoided by reading "The Indian Forester" and all the Annual Reports of the different Provinces, yet the diffusion of knowledge in this way is only partial because it

depends on personal whim whether or not the results are published in "The Forester," while to wade through Annual Reports is not enticing; could not, therefore, some better system be devised? I would suggest that some especially qualified officer should be appointed to collect and note on all such matters, with the liberty to travel to any part of India and see the different experiments in action. This officer should, I think, be subordinate to the Director of the Forest School and should with him form a "Bureau de recherche," while the results of their enquiries might be regularly published in the *Indian Forester*, and so enable everyone to know exactly where to turn for information of this sort. Further, I should make the *Indian Forester* a state concern and relieve the Honorary Editor of much of the worry which he now has to undergo, and that he undergoes purely from public spirit. To compare big things with small, it is enough to remember what immense strides medicine has made through the medium of publicly endowed institutions to see how a "Bureau de recherche" must be a step in the right direction.

I am aware this is not a new idea, but without a little drumming such things do not as a rule arrive at the stage of accomplished facts. I trust, Mr. Editor, you will lend your influence to forward this cause.

T.

A Departmental Blazer.

SIR,

I do not think that any of the colours given in the May Number are quite what we want for the Departmental colours. I would suggest olive green and dark crimson for the blazer, the green might be 2 inches wide, and the crimson $\frac{1}{2}$ or $\frac{1}{4}$ inch, and for ribbons &c., in proportion. Why should we confine ourselves to greens only as if no other colours were ever to be seen in a forest.

I am sure the Coopers Hill members will on further reflection agree to join the movement for Departmental colours. I have constantly seen an Eton and Cambridge man, a fellow of his College and now a distinguished member of the Indian Civil Service wearing the Punjab Commission colours, why then should a member of the Forest Department, albeit a Coopers Hill man, be ashamed to wear Forest Colours.

We do not want any horns, or trees, or anything 'bigarre' or childish, but a combination of simple colours which will be neat and distinctive.

As to the ranks which shall be entitled to wear the colours: as the 'blazer' is eminently an English garment its use should be restricted to Englishmen, but there can be no objection to any member of the executive staff wearing the Forest Colours in ribbons,

or even in turbans, or in coats of the shapes ordinarily worn by natives; in fact, the turban selected for the subordinate staff in the Punjab is almost exactly of the colours here suggested being "green with red edging." I do not think it can be improved on for neatness of appearance or for durability of colour.

C. F. E.

Eucalyptus and Malaria.

SIR,

In the 'Forester' for June 1893, it is stated in an extract from a paper by Mr. Franklin B. Hough, that the formation of a plantation of Eucalyptus round the monastery of Tre-Fontane near Rome has resulted in the monastery becoming habitable, such had been also my idea until a week ago when Monseigneur Philabert Termoz, representative of *les missions étrangères* of France at the Vatican, who is now travelling in the East visiting these missions, told me that all of a sudden three years ago, after malarial fevers had all but disappeared from the monastery, the place had become almost as deadly as before and continues to remain so.

It will be extremely interesting to find out why the beneficial effects of the plantation have so suddenly ceased after having promised so well. Is it because the *massif* has become too dense to allow of an uninterrupted evaporation direct from the soil in addition to the transpiration from the trees? We foresters are aware that in wet lands the leaf-canopy should not be allowed to close up if we wish the ground to be dry enough for the production of seedlings.

BARODA,
1st July, 1893. }

E. E. FERNANDEZ.

Freezing Temperature of Forest Trees.

DEAR SIR,

I read the following in Boppe's *Sylviculture*—"Quelques espèces, comme l'olivier et l'oranger, meurent gelées sous l'influence d'un froid prolongé à la température de -4° ; d'autres, comme le pin sylvestre et le bouleau, supportent, sans paraître en souffrir, un froid de -40° ."

Can any one tell me at what temperature Sal and Teak are frozen : —(i) in hollows; and (ii) in other places ?

T.

III.—OFFICIAL PAPERS & INTELLIGENCE.

Durability of Railway Sleepers.

The annual statement published by the Public Works Department shewing the progress of the experiments to test the durability of railway sleepers takes us to the end of 1891.

On the Ajmere-Khandwa section of the Rajputana-Malwa Railway, sleepers of deodar, creosoted pine, kahoo (*Terminalia Arjuna*), sal, anjan, and teak were laid down in 1876. The following are the results, at the end of 15 years:—

of the Deodar	...	...	94	per cent still sound
" Sal ...	...	...	65	" "
" Kahoo ...	...	...	56	" "
" Anjan ...	...	...	51	" "
" Teak ...	...	...	40	" "
" Creosoted pine ...	...	...	33	" "

In another section of the same railway creosoted pine shewed 41 per cent sound at the end of 11 years.

On the Rewari-Ferozepur section, 1,166 Deodar were laid down in 1882; and in 9 years, 288, or nearly 25 per cent had been removed; but a very much larger proportion of creosoted pine had to be taken out at the end of 4 years.

On the North Western Railway, in the experiment of 1877, only 100 Deodar sleepers have had to be removed out of 1,116 laid down originally, shewing that 91 per cent have lasted 14 years. In the other experiments on this railway, the results are not quite so good.

Sal is the principal timber experimented with on the Eastern Bengal Railway, with varying results: on the main line 62 per cent were still sound at the end of 14 years, while on the Rungpore branch, after 12 years, 78 per cent of the sleepers were still good. Experiments on this railway with regard to iron-wood are also being made, but it is too early yet to say anything about the result.

The conclusion is the same as that arrived at last year, viz. that of the timber under trial, Deodar has hitherto proved the best.

A. S.

The Grasses of the Sandur Hills.

We have received from the Madras Government the Report of the Government Botanist Mr. M. A. Lawson on some of the grasses of the Sandur Hills in Bellary which were sent to him for identification. The following remarks of Mr. Lawson on the condition of the specimens sent, shew that there is reason to hope that the practical teaching in the drying and preservation of plants now taught at the Forest School will not be wasted.

"The specimens were not properly prepared and had to be macerated in water, separated, and re-dried, before they could be

named. The condition in which they are returned is the one in which they should have been sent."

Number.	Vernacular names.	Botanical names.	Where they grow.	Whether they are reproduced from roots or by seed.
1	Bothal hullu ..	Anthistria ..	Grow in tussocks profusely at the bottom of hills	Reproduced both by seeds and roots. Used for thatching huts.
2	Jundigi do. ..	Do. No. 1 ..	Scattered growth ; grows best on the slopes	Reproduced by seed. Cattle like it when it is young.
3	Isaad ..	Do. " 2 ..	Grow best at higher elevations and also profusely	Reproduced both by the seeds and the roots.
4	Nagunuruku grass	Anthistria ..	They grow best in the ravines and shady places	Reproduced by seed. Good fodder grass.
5	Kadayadu hullu	Panicum fimbriatum	Growth scattered and not profuse ; will be found both at the top and the bottom.	Do.
6	Chippigi do.	Panicum Petiverii	Scattered growth everywhere, but not profuse	Do.
7	Aula ..	Panicum millicecum	Growth scattered ; does not grow profusely anywhere	Do.
8	Korrula do.	Setaria glauca ..	Scattered growth, but not profusely. In some cases both on the top and at the bottom.	Do.
9	Selji do.	Manisuris granularis	Grow best at higher elevations and also profusely	Do.
10	Kulthapri ..	Arthraxon lanceolatus	Grow best in a little rocky place and at higher elevations.	Do.
11	Kempu kasari	Heteropogon contortus	Grows profusely everywhere, especially at higher elevations.	Do.
12	Semkini hullu	Do. ..	Grow profusely on the tops of hills and rocky places	Reproduced by roots.
13	Bitaykasari ..	Do. ..	Grow best at higher elevations, but it will also be found below.	Do. both by seeds and roots.
14	Sennakasari ..	Do. ..	Do.	Do.
15	Seday hullu ..	Do. ..	Grow best at higher elevations and also profusely	Do.
16	Chiti'bothal ..	Andropogon Schomanthus var. genuina	Grow best at higher elevations, but it will also be found below	Do. both by seeds and roots.
17	Maravali hullu	Andropogon pertusus var. inaequalis.	Growth scattered both at the bottom and at higher elevations.	Do.
18	Bagati do. ..	Clypeopogon gryllus	Grow best at higher elevations and also profusely	Do. by seed.
19	Naribalu do. .	Aristida cernulescens	Growth scattered ; will not grow anywhere profusely	Do. both by the seed and roots. Best fodder grass.
20	Kadu ragi ..	Echino setyptus	Grow best on the slopes	Reproduced by seed. Good fodder grass.
21	Gubbe grass ..	Eragrostis megastachya ..	Grow best at higher elevations and also profusely	Cattle like it when it is young.
22	Godi hullu ..	Do. bifaria	Scattered growth both on the slopes and the top, but not profuse.	Do. Cattle like it when it is young.

The habit of these grasses is erect. They flower in the latter part of September and in October.

Amended descriptions of Reserved forest boundaries.

The following Circular has recently issued on this subject. "Cases arise in which it may be desirable to publish, by means of a fresh notification, amended descriptions of the boundaries of forest-reserves already notified under section 19 of the Indian Forest Act, or under other forest enactments. It has been ascertained that there is no legal objection to this course, if the fresh notification merely provides for the substitution of a more exact and definite description of the boundaries for that which was originally notified, and which, though purporting to describe the boundaries as they existed at the time, has subsequently become incorrect or proved to be open to misconstruction.

The procedure permitted in the foregoing paragraph must not be held to extend to any such alteration of the boundaries on the ground as would involve either the inclusion of new areas or the exclusion of any lands which have been declared by the previous notification to be reserved forest. Such changes require either a new settlement of the additions it is proposed to make, or, in the case of disforestation, the previous sanction of the Government of India."

Ethnology in India.

We have received from the Government of India papers relating to the Ethnological enquiries now being carried out all over India with Mr. H. H. Risley, of the Bengal Civil Service, as general Editor and referee. The enquiries will, of course, bring out and record an immense amount of valuable information, and, though we see that the Forest Department is not mentioned in the orders, we feel sure that there are many Forest Officers who might be consulted with great advantage, for there are probably few of its servants in India from whom Government could obtain information regarding jungle tribes and their manners and customs so easily as from those who manage its forests.

Analysis of the bark of *Cassia Auriculata*.

We have received official papers regarding some analysis of this bark so well known under the name of 'Avaram' or 'Tangedu' throughout Southern India, which were made by Mr. D. Hooper, the Nilgiri Quinologist, for the Mysore Forest Department. Apparently, at first, the specimens sent were of young twigs only and so the Inspector-General of Forests and Plantations of Mysore complained to the Government of Madras and on enquiry the fact

was reported. As Mr. Lawson very properly pointed out, "the chemist is entirely dependant upon those who send articles for analysis for their sampling." Mr. Hooper's report runs as follows :—

"The Inspector-General of Forests quotes an analysis of tangedu bark made by me four years ago and notices a discrepancy between the results and those obtained on the analysis of a sample of the bark made in England by Professor Hummel. The sample was supplied me by Mr. Cameron and it consisted of young thin bark in small quills and contained much chlorophyll. It yielded the following on analysis :—

Tannin	...	...	...	11.92
Insoluble tannin (phlobaphene)	...	...	...	2.30
Watery extract	...	...	...	22.35
Ash	...	...	...	4.15
Moisture	...	...	...	7.26

"On receiving this letter from the Inspector-General of Forests, I at once wrote for a sample of tangedu bark as used in the tanneries in Mysore district, and Mr. Cameron very kindly supplied me with a 3 lb. sample.

"This bark was evidently from an older shrub as it was thicker and in larger quills, and the tincture of the bark, made with rectified spirit, was brown and not green as in the former case. It yielded on analysis the following constituents :—

Tannin	...	...	...	20.12
Insoluble tannin (phlobaphene)	...	...	...	4.90
Watery extract	...	...	...	29.00
Ash	...	...	...	6.40
Moisture	...	...	...	7.80

"The amount of tannin was the mean of two separate determinations, and this result was controlled by another estimation made by a different process. After exhausting the bark by means of spirit and water, a rich coloring matter was dissolved out of the bark with alkaline solutions. The tannin gave a blue-black colour with iron salts and therefore resembled gallotannic acid.

"It will be seen from the above analyses that the discrepancy referred to in the letter from Mysore was due to the fact that I was supplied with some young bark of *Cassia auriculata* in the first instance, and results were made to compare with the analysis of maturer specimens of other astringent drugs. That there is a great difference in the amount of tannin in the bark taken from different parts of the tree will be demonstrated from the results obtained recently in analysing some *Acacia decurrens*. The twig bark contained 14.7 per cent. of tannin, the small or upper stem bark 25.4 per cent. and the thick or lower stem bark 33.4 per cent.

"I am glad to have had this opportunity of examining the well known tangedu bark again, and trust the analysis will be interesting and satisfactory to the Inspector-General of Forests, Mysore, and to all who are concerned in the economic products of this country."

IV.—REVIEWS.

Annual Forest Administration Reports for 1891-92 for Madras.

The year 1891-92 sees a new departure in the Madras Presidency in that instead of printing the Conservators' Reports and then reviewing them, the Board of Revenue has prepared the Reports themselves from the various District Reports and the remarks of the Conservators on them. The consequence, one that any experienced Forest Officer might have foreseen, is unsatisfactory, for the Report is less interesting than usual, though we are glad to see that the Board themselves are fully aware of its defects and have ordered that in future Conservators are to return to the system of submitting Circle Reports with the District ones and we presume that they intend to extract from these and compile an amalgamated one of their own. It is clear that the logical deduction would be that the Board are hard pressed to find work for their Secretaries. After all what use can all this amount of reviewing and counter reviewing be; this prolonged series of *post-mortem* enquiries into matters of a year which has long passed into ancient history. We are of opinion that the cumbersome system of longwinded annual reports with reviews of many pages is a drag on the work of Forest officers in all Provinces, but in the Madras Presidency it seems to be worse than anywhere, for not only the Conservators, but the Board of Revenue, the Local Government and the Government of India have all to have their say. A certain amount of record is doubtless necessary, but for all the officers of a Department to be forced, after a year's work has come to an end, to sit down and spend days which might better be devoted to their current duties, in compiling reports and statistics which very few will ever consult, and in writing long paragraphs on matters of little interest to anybody outside, seems to us a waste of time and money. And the more so is this the case as it is not only the professional officers themselves who have to do it, but those of the various secretariats have to analyse and write more until the whole subject is worn threadbare and another year's results have come to require attention instead. We hope that some day there will be a change and that a General Indian Forest Administration Report will issue like the very useful ones on the Railways and the Post Office. The Conservators would send up briefer but more professional reports to the Inspector General and he could submit one General Report to the Government of India. On the subject

of the Forest Reports and the position of the Madras Conservators we are glad to quote the following remarks from a leading article in the 'Madras Mail' which shew that the treatment accorded to the Department in Madras, has, as in the very similar but even worse case of Bombay, attracted the attention of unofficial observers.

"In a purely professional matter such as this the Board has naturally found itself in considerable difficulty, and has felt obliged to ask the Conservators to prepare in future a brief Report on the working of their Circles and the general progress of operations therein. It is wonderful that the Board should ever have dreamt that it was capable of dealing with so technical a matter adequately, although it is well-known to have no mean idea of its own omniscience. Still, we cannot but regret that it should endeavour to draw a parallel between the relative positions of the Forest Conservators, and of the Deputy Commissioner of Salt and Abkari; and we cannot believe that the Supreme Government will allow such a subordination to continue much longer. The Report of this Department in future should, so far as its technical details at least are concerned, be prepared by professional hands. It is of little use reorganising the Department if the superior officers are to be reduced to the position of mere forwarding agents between Collectors and the Board, and if they are not to be treated as really responsible for the working of the Department."

It can hardly be expected that officers who are placed in the position thus described will do their best, and the result is likely to be that Government will continue to spend some six thousand rupees a month on three Conservators, who having no responsibility and no stimulus to exertion will wander about the country and do perfunctory work. If it is worth while for Government to employ Conservators (and it obviously is worth while) it is worth while to give them some position and some responsibility and to listen to their advice and allow them scope for their energy in professional matters.

We are very far from complaining of the Madras system by which the District Forest Officers are Assistants to the Collectors and our views have already been expressed in these pages, and were recently corroborated by one of the Forest Officers concerned, in the Article in our May number signed 'Coupe de régénération.' And a practical corroboration is afforded by the article 'The rights of Khonds' which we reprint on another page. But while we hold this part of the Madras system to be the best in India, compelling as it does the Revenue authorities to look at both sides of all Forest questions, we strongly doubt the value of the interference of the Board of Revenue and of their recent reduction of the Conservators to mere inspecting officers. We would draw attention to the article in the 'Madras Weekly Mail' of February 9th, 1898, entitled 'Figure Heads not Heads,' from which we extract the following :—

“A good deal has been lately said about the autonomy of the Forest Departments in India. Here in Madras the question has taken a peculiar form of its own, whereby the Conservators, *i. e.*, the Heads of the Department, have become the mere figure-heads of it, and nothing more. It would be curious to know by what process of ratiocination it was that such a clear-headed official as Mr. Bliss arrived at the scheme of organisation which has now been working for a short time past. He is not given to evolving camels out of his inner consciousness, and his “creation” of the Salt and Abkari Department is a living proof that he understands what the “chain of responsibility” means. The extraordinary thing in connection with this Madras Forest reorganisation is that the Government of India has no delusions as to its weak points, and is desirous of putting the Conservators on an entirely different footing by forming them into an Advisory Board, with a common head-quarters and with a Forest Secretary subordinate to them. The Inspector-General of Forests is understood to be on his way to Madras now, with the object of representing the Government of India’s opinions more fully; but he has been told in so many words that it is little use his coming and that he had much better occupy his valuable time otherwise. Briefly, the Conservators’ case is this. The Forest Code defines the position of the Conservator as “a consulting and inspecting officer having authority in matters of finance and establishment.” His position is analogous to that of Superintending Engineer in the Public Works Department, who, under the Code of that Department, controls all the details of business arising in the Circle with which he is concerned, subject to the supervision of the Chief Engineer, and who affords Executive Engineers the benefit of his advice in the performance of their duties. But the position of the Conservator of Forests, as above defined, has been gradually usurped by Collectors on the one hand and by the Board of Revenue on the other, so much so that the Government quite recently ruled that a Conservator must be content to occupy the position of inspecting and advising officer, with limited authority in matters of establishment and power of control in matters of finance.

‘If the expenditure incurred by the employment of three Conservators in this Presidency, amounting to more than Rs. 60,000 per annum (inclusive of establishment), is justifiable, it can only be so by allowing these officers to exercise the powers conferred on their *confrères* in the provinces under the Government of India, in which the Forest Department is held to be a scientific department to be administered by officers specially trained for the purpose. Otherwise, if the Forest Department here can be administered by Collectors with the aid of District Forest Officers and by the Board of Revenue, the post of Conservator might be abolished and the Department might be amalgamated with the Land Revenue Department. At all events, such measures would be in the direction of economy. It is clearly

'needless expenditure to maintain these well-paid officers for 'merely perambulating Districts and finding fault with works 'undertaken under the orders of Collectors.'

We hope that it will not be long before Madras has a Governor once more who is strong enough to put down officialism, carry out the recommendations of the Government of India and put Conservators of Forests once more into their proper position instead of being mere registrars of so much correspondence. If there is one Department in India which ought to be allowed to escape from the trammels of office routine and the tyranny of the Babu it is the 'Forests'.

We are glad to see that the notification of the Reserved Forests is making good progress, for 2,063 square miles were done during the year, bringing the area on April 1st 1892, up to 7175 sq. miles. Selections for further reservations are being made in most Districts and we are glad to see that the extension of the Forest Act to the Ganjam Agency tracts is contemplated. We fear, however, it is the old story of 'shutting the stable door'—had the Government of 10 years ago listened to the advice of that old experienced Collector Mr. J. G. Horsfall, C. I. E., they might have been in time to rescue some of the big timber forests in a good condition.

An interesting part of the Report is the paragraph where the Board record the policy of the Government as regards grazing and the basis of their settlement of the question. They say:—

"In Government reserves, the cattle actually required for 'agricultural and domestic purposes have been held to have the 'first claim and surplus animals are to be allowed grazing only 'when the circumstances permit of it. The number of cattle required for agricultural purposes is assumed to be three head of 'cattle per holding, the "holding" being taken as the average 'acreage cultivated by a pair of tilling cattle according to the 'ascertained practice in each taluk. These agricultural cattle are 'to be charged half the rates of fees charged for other cattle; 'and for the latter class the following scale of fees has been laid 'down as a maximum:—

			per annum.		
			RS.	A.	P.
' Buffaloes	0	8 0
' Bulls, cows, bullocks, calves, horses, asses and foals	0	4 0
' Sheep and goats	0	2 0

' Goats, however, are to be excluded altogether or confined 'to special restricted areas. In unreserved lands, grazing and the 'cutting of grass are to be free and unrestricted—*vide* rule 9 of 'the rules under section 26 of the Act. These principles received 'the entire approval of the Government of India, and Collectors

'have been requested to give effect to them, reporting in due course how they propose to distinguish agricultural from non-agricultural cattle.'

These orders might, we think, be followed with advantage in other Provinces, but there is one point which seems not to be discerned and that is, what villages are to be entitled to the cheaper rates for their agricultural cattle—in Madras, we presume, all villages will be so treated, for the forests are fairly well distributed over the country; but in other Provinces where the forests are mostly in large blocks away from the great cultivated plain, it would be rather difficult to fix the limit.

The remarks on *Natural and Artificial Reproduction* are usually interesting in the Madras Reports, but this year they are less so than usual, as it is natural to expect, for professional matters like these are much best treated by professional writers. However, we extract the following on the seeding of the thorny bamboo, with the remark that we should much like to hear some more on the subject.

"Cuddapah.—Except in two places in the Balapalli working circle, the *Bambusa arundinacea* seeded all over the district. It has not been ascertained, or reported, whether, in these two localities, the fellings and thinnings of the bamboo had anything to do with its non-seeding. In one place, the bamboos were cut up into three foot lengths and planted on the sides of a path to serve as a fence; when the shoots were four feet high, they seeded as did also the parent culms. The District Forest Officer concludes that this instance shows how all the bamboos of one clump, however separated, seed at one and the same time."

The financial results of the year were very good, though the surplus revenue was less than that of 1890-91. The figures were :—

Revenue	...	...	...	Rs. 16,94,215
Expenditure	...	...	...	„ 12,83,929
			Surplus	„ 4,10,286

The following is the yield of the forests for the year :

				cft.
Timber	...	...	...	3,086,937
Fuel	...	...	...	13,987,173
Bamboos	...	...	...	31,148,005
Value of Minor Produce	...	...	Rs.	6,40,842

V.-SHIKAR AND TRAVEL.

Chakla Drogmula.

(Continued from page 279.)

I must now hark back to Drogmula where demarcation was started ; the village is situated in a veritable plain dotted here and there with large walnuts, a chinara or two and hundreds of fruit trees, some in regular orchards and others scattered about singly. The chinara does not thrive in this part of the country, the soil being probably too hard, as the tree appears to favour a sandy soil with a good supply of water. At Drogmula village there is one very curious old tree, the original trunk is a blackened and hollow shell, but the base close to the ground has spread out to a great size, perhaps 40 feet in circumference, and from this have sprung up some 50 other stems, these in turn as they have reached the size of an ordinary tree, dying at the top and becoming blackened, the whole looking like a small grove of chinaras. Here also is to be found the crooked and knotty *bér* (*Zizyphus oxyphylla*), very handsome sticks can sometimes be obtained from this. Demarcation was begun in the forest adjoining this village and at first there was great consternation among the villagers who imagined that all sorts of terrible things were going to happen from the putting up of the pillars. An idea got about that no land which had been even once ploughed, would be included, consequently there was a rush to hack down a few bushes and drive a plough then and there and then claim it as cultivated land. Some of the attempts were particularly barefaced, the ploughs having been run along only the day before. Sometimes the people were very obstinate, declaring they could not exist if the pillars were erected and winding up with the usual threat, dear to the Kashmiri, of going away to the Punjab, though what they would do there is difficult to say : they would soon find the heat there somewhat different to that of their own country, for Jack Kashmiri does not like the heat any more than we do. However, they were quieted after a time and went on with the work, but it gets monotonous to have to meet and overcome the same silly objections in every new place. As a matter of fact we are very liberal, excluding not only all really cultivated land but also any that is cultivable, even at the expense of small patches of forest. We seldom have to clear lines through jungle, which delays the work very much, but can generally find an open line along the edge of the actual

forest ; the plan is to so place the pillars or posts that standing at one, the next in either direction can be readily seen ; the posts are about 7 feet long of which one foot is sunk in the ground, then a stone pillar is built up round the post to 3 feet above ground leaving 3 feet of the post visible, this is quite a sufficient landmark and inexpensive. Here and there at prominent angles pukka pillars will be built, this will be done hereafter, the important thing is to get the boundary marked out in order to prevent any more land being broken up for cultivation. I was rather amused at one fine old Goojur who began the usual whine about *baubád hojate* &c ; I said "you are a *pardesi* surely you came from the Poonch State," he admitted the soft impeachment. I then told him he had no right to anything, the land being the property of the Kashmiris, but he said it was his *Kismat* to come long ago, so I retorted that I quite agreed and it was also my *Kismat* to come and put up the pillars : this struck him and he grinned cheerfully admitting it was so, and we became friends once more ! But the most curious idea of all, is one that these people have to the effect that I have leased the Kashmir forest for two years and they believe or pretend to, that I want to shut them out of the forests. It seems curious that, although I have been two years in the State, they should not know the real facts. It would appear that there was some proposal to lease the forests to a speculator just before I arrived on the scene, or more likely an offer was made by some sharp customer of a large sum down, if he got a lease. Luckily it was not entertained, or there would not have been much forest left ; the villagers probably heard of this and put two and two together making it five ! The present position of affairs is a curious one, and this Department is somewhat in the position of a Bank on which a run has set in, the run being to clear as much land as possible before the pillars are put up and then declare it a ten year old field. Not long ago, I happened to go to an eminence and afar off espied unmistakeable signs of a clearing in a forest across the valley ; I at once sped across and found to my disgust that a Khyberi, of whom there is a settlement in this part, had begun to nibble at a grand plateau, covered with a fine forest of blue pine, just as a mouse would nibble a corner of a cheese. I had therefore to stop work at Drogmula and hurry off to the place and for three days we were hard at work encircling this tableland with a line of pillars. While engaged in this work we found, alas, ! that another miscreant had cultivated a small area in the very centre of the forest : we hope, however, to get rid of him as it is pretty certain this was unauthorised and not entered in his *Kheirat*. The wearying part of it all is that we know well enough this sort of thing is going on everywhere : and what is far worse, the Goojurs from Poonch squatting in the heart of the forests, clearing and building villages. Oh ! for half a dozen of my old friends of the Forest Department to run the thing through sharp and put an end to these little games ! !

As this Drogmula Chakla contains the only really valuable deodar forest in Kashmir proper, it has been decided to build a small forest house here. A lovely spot has been chosen on a small open plateau at the foot of the main ridge, it is surrounded by deodars and other trees and elevated well above the plain, and is just inside the forest boundary. A small stream of the purest water runs, just below, and while being far enough from villages to escape the village nuisances in the shape of dogs and cats, still near enough for all purposes of supplies and labour. It is hoped the house will be finished this summer, if so any Forest friends who find themselves in that locality are invited to make use of it, and they will not repent spending a few days in this beautiful spot.

The forests near Drogmula village contain perhaps an equal proportion, roughly speaking, of deodar and blue pine, and there are still fine trees to be found here and there, but they are not to be compared with the forests near Kandi which are almost pure deodar and have many more first class trees. The reproduction is very good in both places in favourable spots and as last year was a good seed year the ground is now covered with thousands of seedlings and as there is not much danger of fires now, it is hoped that many will survive. If so, it is pretty certain that the restocking of blank spaces will be assured; the grazing will hardly affect it since very few cattle graze inside the forest, and goats and sheep go to the grassy uplands beyond the limits of the deodar. Having seen a good deal of deodar forest in my time, I have pretty nearly come to the conclusion that we need not be so very particular about cattle grazing, in fact, I would almost go so far as to say that it would be beneficial in many places in keeping down the rank herbage, and if my friend A. L. M. in Chamba, could only be induced, Mr. Editor, to send you his views on the subject, the question might be threshed out.* I always think of Compartment No. 6 in Kalatope, which has never been closed to grazing and yet its natural reproduction is wonderful; I first saw it as far back as 1870 and 1871; and when I held charge of the Division in 1881, I went carefully over it and was surprised beyond measure to see how the young trees had gradually grown beyond the reach of cattle, and how the blank spaces were being gradually restocked; of course the number of cattle using the pasturage was small but then so it is almost everywhere in the hills. On the other hand in Kainthli and Bakani (Chamba) where no grazing whatever is allowed, it has been found that plants put out are completely choked by the strong growth of grass and other herbage.

(To be continued.)

*NOTE.—We shall be glad if A. L. M. will respond to this invitation.

VI-EXTRACTS, NOTES AND QUERIES.

Forest fires in France.

We read in the *Revue des Eaux et Forêts* that owing to the drought there have been some serious forest fires in different parts of the country. And the worst is that they were clearly due to incendiarism. Near Alençon, parts of the forests of Perseigne and Ecouves were burnt, mostly Scots pine. In the Landes, about 137 sq. miles have been burnt over and enormous damage done. Special measures have had to be taken and several persons have been arrested, one of them actually in the act of firing the forest of Teich.

Forest Fires in England and America.

The following extracts shew that the present phenomenally dry season in England has been productive of serious forest conflagrations. The results of fires in America as described in the last extract are simply appalling. They shew, if anything does, the need of an American Forest Department, part of whose chief business would be the organization of fire-protection and fire prevention works on a gigantic scale.

SEVENOAKS.—A fire has been raging at Sealchart, near Sevenoaks, and about forty acres of valuable underwood has been destroyed.

ARUNDEL.—Shortly after noon on Sunday a man lighted his pipe and threw the match on the bank of the main road between Pulborough and Arundel, Sussex. In an instant the grass and bracken took fire, the flames spread to the plantation at Watersfield Towers; and, in an incredibly short time, more than four acres of fir trees, shrubs, heather, and bracken were blazing furiously. The fire was confined to the plantation, which was extensively damaged, large numbers of trees and choice shrubs having been consumed.

AMERICA.—The forest fires in Northern Wisconsin, a portion of Minnesota, and the upper peninsula of Michigan continue to spread. In Minnesota the territory attacked by the flames extends over fifty miles, and includes eight new mining towns, four of which

have been completely destroyed. In Wisconsin, the fire is in scattered patches. Many small towns have been burned in the tract of country along the shore of Lake Superior, between Michigan and Minnesota, a distance of ninety-six miles, the flames embracing nearly 8,000 square miles. Ashland and other large cities are in danger. It is estimated that 100,000,000 square feet of pine have already been burned, and heavy rain can alone check the progress of the conflagration.

Opening of closed forests in France.

In consequence of the severe drought in France orders have been issued to Conservators of Forests to do all in their power either by allowing pasture in closed forests or by concessions of cutting grass, leaves, etc, to assist the owners of cattle in getting over their present distress. *Revue des Eaux et Forêts.*

The Rights of Khonds.

The Khonds of the Mohiri hills in the Ganjam district submitted a petition last year to H. E. the Governor of Madras setting forth certain grievances for which they craved redress. The first was that the fruit trees on their lands, instead of being left to their enjoyment, are leased out in auction by the Forest Department; second, that the officers of the Forest Department have abolished their ancient privileges of taking timber for ploughs, fuel, house-building, &c.; and third, that they are no longer permitted to clear jungle for cultivation. As regards the first grievance, Government and the Board of Revenue agree with the Collector that the Khonds deserve consideration. The old assessment on their lands was fixed with reference to both cultivated land and fruit trees, while the present assessment, which is in excess of the old, is calculated on the land alone. The present assessment was so fixed as to give nearly the same average rate per acre as before, but it stands to reason that a village which could afford to pay an average rate of Rs. 1-2 per acre for wet and dry land as long as it had also a number of fruit trees free of charge, can no longer afford the same rate when deprived of the trees. The loss to the Khonds can be estimated by the fact that the produce of these trees is now leased out at an annual rental of Rs. 421, but this does not represent their full value to the Khonds, which may be fixed correctly at Rs. 650, which is a great deal in a total assessment of Rs. 1,962 for the Mohiri hills, or roughly, a

third of the present assessment. But it is not intended to restore the old privilege of the use of forest produce free to the Khonds as it would not benefit these ignorant hill people, but would eventually go into the maws of low country sowcars. In fact, the Collector believes that the complaints really emanate from the latter and the Khonds are merely the "stalking horse" of the sowcars, to whom they are heavily indebted and who hope to make a profit from forest produce under cover of Khond rights. The fact of these unfortunate Khonds being in the clutches of the sowcars is proved by the fact that the patta lands of the village of Niliguda have actually passed by Civil decree to the hands of a money-lender, Jodda Naiko, of Berhampore, in satisfaction of debts due to him. To allow the Khonds the usufruct of the trees in the forest reserves free of charge is also most objectionable from a forest point of view, and to give them the free use of the trees outside the reserve would remove but a small part of their grievance, while to reduce the assessment will be a boon to all and should benefit the Khonds and not the money-lender, excepting where the patta has actually passed to the latter. Government has, therefore, decided to compensate the Khonds proportionately for the loss of usufruct of the trees in the forest reserves only by reduction of assessment, and to restore to them, if they prefer it, the unrestricted enjoyment of all trees situated in the waste lands outside the reserves. As regards kumeri cultivation or clearing jungle for cultivation and the cutting of wood, the Khonds cannot be said to have any legal grievance, for the former was a privilege and not a right, and had to be put a stop to in order to prevent the denudation of forests. The Khonds have liberty to cut wood, bamboos, &c., to any extent outside the forest reserves free of charge for all private purposes, and the area excluded is sufficient to provide for their necessities for many years to come.—(*Pioneer* May 1893.)

‘The Panoram.’

A photographic camera, which it seems probable will in the future play an important part in the mapping of unsurveyed countries, has been invented by Colonel R. W. Stewart, R. E. and Mr. Tweedy of Plymouth. It has the advantage of being smaller than an ordinary camera of the same capacity, and is also lighter, all the fittings being made of aluminium. It is easy to manipulate, and not likely to get out of order. The instrument consists of a rectangular box, whose length from back to front is a little more than the focal length of the lens to be used, its height is somewhat greater than the width of the film (for an 8-inch spool the height would be just 9 inches), and the breadth is a fixed dimension of 5 inches for all sizes. This Camera rests on a circular disc, forming the head of the tripod-stand; to the bottom of the box is screwed, in a central position, a

tubular arbor fitting into a socket in the disc and the camera revolves freely on the stand; the box opens down one of its vertical edges, so as to give access to the hinder part of the camera or roll-holder: in this roll-holder are fixed four vertical rollers. The first of these has the tissue supplied by the Eastman Company wound on it, the second and third rollers serve to keep the film in the focal plane; and the fourth, which is called the winder, is actuated by a clock motion, with fly escapement, placed in the front part of the camera, the fly being normally blocked by an arm actuated by a pneumatic ball and tube of the ordinary kind. When required for use, the camera is set up on its stand and levelled, the clock is wound up, the slit aperture adjusted, and a suitable stop put in; the camera is then turned round till it points to the left hand of the view required, the pneumatic bulb is squeezed when the clock starts working, and the camera begins to rotate, and continues to do so until the right-hand corner of the view is reached; the bulb is then relaxed, the clock stops, and the camera ceases to revolve. This is but a very general description of this ingenious instrument, which if used at each end of a base will give the angles between all objects photographed. The speed of rotation of the camera itself, and the rollers on which the film is wound, being all actuated by one motor and connected with one another, the ratios of motion must remain the same, and as the rates of such motion can be regulated by altering the ratio of the diameters of the roller and its pulley, it follows that the true rate of motion can be found. In the larger form of camera the films are rather more than 5 feet long, when photographs of the whole circle are taken, in which case they are developed by being primed on to the periphery of a drum, mounted on a horizontal axis, the sensitive surface just dipping into a dish holding the developer, the drum is then rotated until development is complete.—(*Geographical Journal*.)

Wayside Planting by Village Improvement Societies.

In the planting of trees by village improvement societies both use and beauty should be included in "improvement." What is useful and beautiful in one case may be unnecessary and unpleasant in another. The great aim should be appropriateness. For instance, no tree is more suitable for shading village streets than the Elm, its high arching branches affording ample shade for comfort and not enough to keep the road in a muddy condition after rain. The old New England towns owe much of their charm to the wayside Elm. I refer especially to villages and towns where houses and shops are close together. Outside of towns, on inland high-roads, long level stretches of Elms may be used effectively, especially where clusters of houses at short intervals form a semi-

detached village. There are many other fine shade-trees which may be planted for variety:—the Oak, Maple, Beech, Chestnut and Linden. The Tulip-tree has recently been suggested for roadside planting, but it is not a graceful tree for this purpose.

For a shade-tree along much frequented inland roads, the Elm has an evident advantage over conically shaped trees. It is admirably adapted, also, for planting on home and school-house grounds and for shade in fields. Along less frequented roads, in many places, no trees should be planted at all. I have in mind a country road where occasional White Birches had grown up irregularly, and Maples had recently been planted on either side. In several instances a young Maple was set out directly under a good sized Birch. The new trees might have been grouped naturally at intervals for shade and thus made to harmonize with the irregular Birches, but the effect of this planting was formal in the extreme. I know also a triangle by a country highway where a few Pitch Pines at one end have been left in a group. I doubt if any one would have thought of planting Pines in such a spot in such a manner, but the effect of this natural arrangement is both interesting and beautiful.

As a rule, our country road-sides are at their best when planted by nature. Open views on one or both sides of the way, alternating with shady spaces, are vastly more attractive than continuous, monotonous, artificial planting. Occasionally we see a piece of road on which trees would be an improvement, especially where a new way has been cut through a bare region. But often nothing is wanted beyond leaving the bushes and vines unharmed. Now and then there is an obtrusively ugly spot where an adjoining bank of the highway has been dug out for gravel or blasted for rock. In such a spot, a clump of English Beeches or White Birches in the foreground would quickly soften the effect. In repairing our roads, care should be taken not to disturb the wild Roses, Barberries, Elderberries and many other delightful shrubs and flowers where they will flourish and multiply if left alone; if these have been disturbed it would be well to replace them.

I would urge, also, that our country roads be not widened unnecessarily. In villages and towns wide roads are important, but in the country, narrow roads are, as a rule, much more picturesque. As to the useful side of the question, Professor Shaler, in a recent article on the "Betterment of our Highways" writes "In this country as well as in most of the states of Europe, the tendency is to make the road-bed a good deal wider than sound practice dictates. A part of the badness of our American roads is generally due to the fact that the tracking is far too wide to be effectively maintained. In this, as in many other of the grosser arts, we may well take a lesson from the ancient Romans, perhaps

the earliest skilful road-makers in the world. Their roads were, indeed, much narrower than those which are commonly found in our country districts."

If more trees are desired for a tree-lined sea-shore road with occasional stretches affording glimpses of the ocean, other kinds than inland Pines should be chosen. These should not be set regularly in a row, but in occasional groups. Willows, and in some especially adapted places a row of Lombardy Poplars, harmonize with marsh or sea. An objection to Lombardy Poplars may be made because they are not long-lived; but where they are planted at rare intervals for beauty, not for shade, they can be replaced after a number of years.

I should suggest that these three points be borne in mind: Where continuous passing and frequent lounges close to the road (as in village streets,) demand shade-trees, there artificial and regular tree-planting, especially of Elms, is appropriate both for use and beauty. That in improving country roads outside of villages, we should remember that improving does not necessarily mean changing in effect apart from keeping the road in order. That what may be a most charming addition inland may be inharmonious by the sea; and that in every case we should consider whether we are working for use or for beauty, or for both combined, so that each result may be appropriate.—(*Garden and Forest.*)

To our Exchanges.

We should be much obliged if those Editors of contemporaries in India with whom we exchange this Journal would pay us the usual compliment of acknowledging, as we ourselves invariably do, the source of their extracts. In the 'Indian Agriculturist' of July 8th there is one such extract from our June No. from the article on 'Experiments at Dehra Dun' which *must* have come from our pages; there is one extract from our 'Review of Road Arboriculture in the Central Provinces,' an obvious extract because the reference to 'Arbor Day' was our own and did not occur in the report; and there are no less than six short paragraphs on the subjects of 'Assam indiarubber trade,' exploration of Indiarubber in Burma, 'reproduction of Sal in Assam' "relation between the flowering of bamboo and the reproduction for teak" 'casks from Indian Oak woods' and 'planting of cutch in Burma', all of which bear every appearance of having come, with slight alterations here and there, from our Review of the Forest Administration Reports. Not one of these acknowledges the Forester as its original publication. Even the *Indian Forester* which depends on departmental interests for its circulation chiefly and has not to advertise itself, likes to have the credit of its work.

VII.—TIMBER AND PRODUCE TRADE.

Statement of average selling rates of timber and bamboos in Meerut, Cawnpore, Bulandshahr, Pilibhit, Bareilly, and Moradabad for the quarter ending 31st March, 1893.

Description.	Timber Scantlings per score.		Bamboos per 100 score.		REMARKS
	From	To	From	To	
MEERUT.					
Sal 10' Tors (Poles) ...	8 0 0	18 0 0	...	...
Sal & Sain, &c., Karris, 12' x 5" x 4" ...	25 0 0	40 0 0	...	...
Sal bed posts, 7' x 2½" x 2½" ...	8 0 0	12 0 0	...	...
Bamboos of 9' to 10' per 100 score ...	...	...	28 0 0	80 0 0	
CAWNPORE.					
Sal 10' Tors (Poles) ...	5 0 0	6 0 0	...	...
Sal, and Sain &c., Karris, 12' x 5" x 4" ...	25 0 0	100 0 0	...	...
Sal bed posts, 7' x 2½" x 2½" ...	15 0 0	19 0 0	...	...
Bamboos of 9' to 10' per 100 score {	...	...	25 0 0	30 0 0	
			30 0 0	50 0 0	
			50 0 0	1,000 0 0	
BULANDSHAHR.					
Sal 10 Tors (Poles) ...	...	...	...	..
Sal, and Sain &c., Karris, 12' x 5" x 4" ...	...	...	...	...
Sal bed posts, 7' x 2½" x 2½" ...	...	...	...	..
Bamboos of 9' to 10' per 100 score ...	...	..	50 0 0	50 0 0	
PILIBHIT.					
Sal 10' Tors (Poles) ..	40 0 0	70 0 0	...	...
Sal and Sain, &c. Karris 12 x 5" x 4" ...	30 0 0	40 0 0	...	...
Sal bed posts 7' x 2½" x 2½" ...	5 0 0	8 4 0	..	...
Bamboos of 9' to 10' per 100 score ...	...	...	60 0 0	100 0 0	
BAREILLY.					
Sal 10' Tors (Poles) ...	5 0 0	10 0 0	...	..
Sal & Sain, &c., Karris, 12' x 5" x 4" {	25 0 0	35 0 0	...	...
5" x 4" {	50 0 0	40 0 0	...	...
		60 0 0	...	...
Sal bed posts 7 x 2½" x 2½" ...	10 0 0	15 0 0	...	...
Bamboos of 9' to 10' per 100 score ...	...	..	50 0 0	137 8 0	
MORADABAD.					
Sal 10' Tors (Poles) ...	20 0 0	25 0 0	...	...
Sal, & Sain, &c., Karris, 12' x 5" x 4" ...	30 0 0	50 0 0	...	...
Sal bed posts 7' x 2½" x 2½" ...	10 0 0	12 8 0	...	...
Bamboos of 9' to 10' per 100 score ...	...	...	50 0 0	100 0 0	

Churchill and Sim's Circular.

JULY 4th 1893.

EAST INDIA TEAK.—The deliveries for the first half of the year were 6564 loads in 1893, 5,665 loads in 1892, and 8,055 loads in 1891. For June in the three years the figures are respectively 1,257 loads, 1,396 loads, and 1,487 loads. The state of the shipping trade still weighs heavily on the Teak market, and business, continues greatly curtailed. The stock remains about stationary, and there is no change in quotations save for some balances having been cleared off at auction, mostly at impossible prices.—

ROSEWOOD.—Stocks are moderate, but ample for current demand which is full.—

SATINWOOD.—For finely-figured *logs*, good prices could be made, but for small, plain wood there is very little enquiry, and *planks* and *boards* are not wanted.—

EBONY.—Sells very slowly, even at the low prices now current.—

PRICE CURRENT.

Indian Teak	per load	£9	to	£15
Satinwood	„ ton	£5	to	£12
Rosewood	„ „	£5	to	£9
Ebony	„ „	£5	to	£7

MARKET RATES OF PRODUCTS.

(Tropical Agriculturist, July 1893.)

Cardamoms, Malabar	per lb.	2s.	to	2s.6d.
Croton seeds	per cwt.	16s.	to	20s.
Cutch	„	20s.	to	27s.6d.
Gum Arabic, Madras	„	15s.	to	50s.
Gum Kino	„	£15	to	£20.
India Rubber, Assam	per lb.	1s.7d.	to	2s.3d.
„ Rangoon	„	1s.7d.	to	1s.11d.
Myrabolams, Bombay	per cwt	10s.	to	11s.3d.
„ Godavari	„	7s.9d.	to	8s.3d.
Nux Vomica	„	8s.	to	9s.6d.
Orchella	„	22s.	to	28s.
Redwood	per ton	£3.	to	£3-10s
Sandalwood, logs	„	£35	to	£55
„ chips	„	£9	to	£30
Sapan wood	„	£4.	to	£7.
Seedlac	per cwt	40s.	to	70s.
Tamarinds	„	8s.	to	9s.

THE INDIAN FORESTER.

Vol. XIX.]

September, 1893.

[No. 9

A tour in Jaunsar.

April 27th. On the road from Bodyar to Koti-Kanásar, we noticed the natural reproduction of Deodar and Blue Pine, which is particularly good in the lower portions of the Missau block. This young crop is entirely due to fire conservancy, which was instituted in 1872, and it has come up on favourable aspects, and under certain conditions, in spite of grazing. The following reasons are suggested in the Journal of 1891 for the excellence of this reproduction as compared with that in Bodyar :—

‘ The soil of the Missau block is deeper and contains more moisture than that in the Bodyar block. The greater amount of moisture is due to the impervious nature of the shale or slate in the former block, and to the extremely permeable nature of the limestone, which is the prevailing rock, in the latter. Rain falling on limestone passes through it at once. The Missau block lying on northern and western slopes receives less sun and is generally cooler than the Bodyar block, which looks south and east. More snow falls on the slopes above the Missau block, this melts more gradually, allowing a larger portion of the resulting water to infiltrate into the soil and sub-soil. The loss of moisture by evaporation is also less.

‘ Shale decomposes readily to form a soil rich in clay, while limestone decomposes very slowly and forms a very shallow poor soil, the purer the limestone the shallower the resulting soil.

‘ The altitude is less, the temperature is consequently greater, the growth more vigorous and natural regeneration favoured.

‘ The presence of mature Kail and Deodar trees on the slopes higher up in the Missau block capable of producing fertile seed in large quantities. The absence of seed-bearers in Bodyar block and the thick matted growth of grass which prevents seedlings from germinating.

‘ Deodar is not eaten by sheep when grass is available, and there is still plenty of grass in the block. Kail is not generally eaten by cattle owing to the great quantity of resin it contains and the consequently unpleasant taste of its leaves.’

In the portion below Asmari Chak, we found the annual shoot of deodar in the open to be 24 inches, while that of blue pine was 30 inches. The further we get away from the seed-bearers the less deodar there is in proportion to blue pine, the seed of which is light and is carried further by the wind. It is in these lower portions, where the deodar is not so numerous, that cleanings are urgent, as the principal species is more likely to be suppressed. In 1890, cleanings were undertaken in this block, and now the blue pine are all dead. When a girdled pine is dead, the roots become quite rotten and it is liable to be blown down in a storm, or to be brought down by snow; we noticed several instances of the latter, and the damage done to the deodar is considerable. Did funds and time permit, it would be better in the interests of the crop to cut down the blue pine, at the time of the cleaning, as the fall of the sapling can then be easily directed; but as nearly 100 acres of this kind of crop in the Deoban range have to be operated upon every year according to the working plan, it may not be possible to do otherwise than girdle the large saplings.

The wood of the girdled pine has been extensively attacked by the larvæ of a Scolytid beetle; it is not likely that any sound trees are injured by this insect, we saw no traces of this either last year or this.

At Koti-Kanásar, some of the students girdled or cut down blue pine in the Kophti block below the path to Deoban, and freed 775 deodars; they also received instruction in Abney's level, as used for finding the heights of trees. The area girdled last year was inspected and it is found that the pine were beginning to show symptoms of decay.

We were there too short a time to count annual rings, but the following measurements were made by the students in 1888 and 1891:—

In 1888, they counted the annual rings on three deodar stumps close to the camping-ground, with the following results:—

Inches from centre.	Number of rings.			Inches from centre.	Number of rings.		
	I.	II.	III.		I.	II.	III.
1st ...	8	11	6	13th ...	14	3	12
2nd ...	5	15	6	14th ...	18	2	5
3rd ...	5	35	6	15th ...	7	4	5
4th ...	3	6	3	16th ..	8	10	8
5th ..	3	2	7	17th ...	10	6	5
6th ...	4	6	6	18th ..	12	5	5
7th ...	5	7	6	19th ..	10	7	4
8th ...	7	3	5	20th ...	9	0	7
9th ..	5	10	7	Add for height			
10th ...	4	3	11	from ground	10	10	10
11th ...	6	4	15				
12th ...	6	5	23	Total	159 yrs.	154 yrs.	162 yrs.
Girth ...	...	...	...	
Mean radius ...	...	...	...	11'	11'-4"	11'	
Age when tree attained girth of 6 feet = $11\frac{1}{4}$ ' radius ...	...	...	...	20"	19"	20"	
Average No. of rings per inch radius ...	...	...	...	58	104	89	
				7	7	8	

In 1891, the rings were counted on mean radii of 3 Deodar stumps : the results are tabulated below :—

Inches from the centre.				NUMBER OF RINGS.		
				1st tree.	2nd tree.	3rd tree.
1st	...	...	...	12	9	14
2nd	...	...	...	6	7	11
3rd	...	...	...	12	8	9
4th	...	...	...	14	6	4
5th	...	...	...	6	11	10
6th	...	...	...	4	9	6
7th	...	...	...	3	7	10
8th	...	...	...	3	9	9
9th	...	...	...	4	14	10
10th	...	...	...	3	9	12
11th	...	...	...	2	6	11
12th	...	...	...	4	7	9
13th	...	...	...	4	7	9
14th	...	...	...	3	7	6
15th	...	...	...	3	8	6
16th	...	...	...	4	9	5
17th	...	...	...	5	5	6
18th	...	...	...	8	...	5
19th	...	...	...	4	...	7
20th	...	...	...	8	...	9
21st	...	...	...	3	...	7
22nd	...	...	...	3	...	8
23rd	...	...	...	4	...	6
24th	...	...	...	3	...	10
Add for height above ground				5	5	5
Total				130	143	205
Mean radius in inches				...	16	20
Age when tree attained girth of 6 ft.				71	98	100
Average No. of rings per inch				6	9	9

The mean of these observations gives 88 years as the age in which a deodar, in this forest, would attain six feet in girth. The Working Plan calculations, probably made from a greater number of observations, lead to 80 years ; the difference is not great.

The deodar trees in the small temple grove were measured with the following result ;—

	Girth.			Height.
1.	18'9"	...	...	122'
2.	15'	...	...	145'
3.	11'2"	...	...	158'
4.	10'11"	...	...	160'
5.	10'9"	...	...	145'

In counting annual rings, the best plan is to measure the longest and shortest diameters, to add them up, and divide by 4 ; then find and mark the mean radius corresponding to this, there will generally be two, and to count and record the rings in every inch. We can thus ascertain the age at which the tree attained any given girth. To arrive at a satisfactory result for any given forest a large number of observations must be taken.

29th April.—March from Koti-Kanásar to Konain ; the path leads through the village lands of Mangtar and Tiuni, and we observed several trees lopped for various purposes, the oaks and *Celtis* for fodder, deodar for litter and manure. The three zones of vegetation were well observed on the hill opposite, spruce and silver at the top on Kanjatra and Kophti ridge, then deodar with its associates blue pine and moru oak, and lower down chir pine with some ban oak. At the bottom of the valley we crossed the Binalgadh and found *Cæsalpinia sepiaria*, *Alhizzia Julibrissin*, *Pistacia integerrima*, *Rhamnus persica*, *Rhus semialata* and *Olea cuspidata*. From the Binalgadh to Konain is a stiff climb of some 3,500 feet up a bare hill side.

1st and 2nd May. The monthly oral examinations in Forestry were held on these dates.

We inspected compartment 4, Konain, in which improvement fellings were made last year, the trees being marked by the students in 1891, as follows :—

Species.	Under 1 foot diameter	1-2 feet diameter	2-3 feet diameter	Over 3 feet diameter	Total.	Remarks.
Deodar ...	1	...	...	...	1	Head broken badly.
Kail ...	8	6	3	...	17	
Rai and Morinda ...	76	86	49	3	214	
Other species ...	3	3	...	...	5	Chiefly birch.
Total ...	88	94	52	3	237	

The slope is steep (40°) and the aspect N. E.; the crop consists of spruce and deodar, with blue pine, birch, moru oak, and a little silver fir

The object of the improvement fellings in this forest is as follows :—

- (1) to give more space to the crowns of deodar poles and trees by the removal of inferior species, generally spruce, which are crowding them up.
- (2) to free deodar small poles and the larger saplings (especially if in groups) by the removal of over-topping spruce and silver fir.
- (3) to give more room to fertile deodar seed bearers to enable them to bear seed.

These are the principal objects ; and in cases where we come across groups of young saplings of fir, we may give them more room by removing one or two mature firs around them. All the material can be utilized as fuel, owing to the new road to Chakrata, *viâ* Pandawa.

We marked trees in this compartment as under :—

Kind of tree.	Under 3' girth.	3'—6'	9'—9'	Above 9'	Total.	Remarks.
Blue pine ...	48	21	17	0	86	
Firs ...	30	31	27	12	100	
Deodar ...	1	1	0	0	2	Broken tops.
Miscellaneous ...	1	3	3	1	8	
Dead trees ...	3	10	4	1	18	More dead trees were marked than the No. given here.
Total ...	83	66	51	14	214	

Fire conservancy was introduced here in 1872, and before that, fire must have been severe, as the charred remains of many old trees and the large scars on the upper sides of many standing deodars testify. The Konain forest has been heavily worked in past years for building material for Chakrata, and the supply of green and dry timber to the villagers ; but in spite of these heavy demands, the forest has a grand future before it, as it is well stocked, and consists for the most part of deodar ; there are some splendid deodar thickets with complete canopy.

We examined deodar plantation No. 2 of 1876, in Compartment 4. The place is well drained and sheltered, soil good, aspect N. E. The planting was done close, 5 feet by 5 feet, and the lower

branches are now dead. As an exercise, we pruned off the dead branches up to two feet from the ground. The seeds were sown in the Tika nursery in 1872, pricked out into nursery lines in 1874, and put out in 1876, in pits 5 feet by 5 feet. Measurements made are as follows :—

1885	average height	50	plants	5	ft.	9	in.
1893	"	573	"	13	"	4	"

Some of the original plants which have been allowed to grow on in the Tika nursery are now about 15 feet high. The spot chosen is perhaps too flat for deodar and not sufficiently drained, as these plants do not compare favourably with a similar case in Bodyar (*vide* page 287.)

We examined some instances of plot sowing near the nursery ; the plots are 10 feet by 10 feet scattered about among *Indigofera* and other shrubs, and contain from 6 to 10 plants each, probably 15 years old, the length of the annual shoot being 13 inches.

Another instance of plot sowing is to be found in the Chaulu 'that,' Siari block, where in 1875 a clear felling was made over an area about 600 yards long and 300 yards wide. The aspect of this place is N. E., and the gradient about 25°. A few moru and spruce were left as seed bearers, and immediately under the former, some seedlings of moru may be found ; but otherwise the area was over-grown with willows, poplars, brambles, *Strobilanthes*, and other shrubs, and the reproduction by seed was *nil*. Hence in 1881, plots 5 feet by 5 feet were sown with deodar seed, 500 seeds to a plot ; superfluous plants which came up were used in filling up blanks. We counted 43 plots and found 764 plants, giving us an average of 18 plants in one plot with an average height of 6 feet ; it would be advisable to thin out these plants leaving 2 or 3 of the dominant ones in each plot. This area is interesting as demonstrating how important it is to avoid making anything in the nature of a clear felling in these hills.

The Gidhi Khud Coppice of Karshu Oak.

This coppice forms a portion of the Hajawa Forest and is included in a working circle with two detached areas of Karshu as follows :—

Gidhi Khud	12	compts.	38	acres.
Hajawa	4	"	12	"
Jadi	4	"	12	"
	—		—	
Total	20	"	62	"
	—		—	

From the above it will appear that the rotation of the coppice is 20 years, and the average size of the annual coupe 3.1 acres. The elevation of Gidhi Khud is over 9,000 feet and growth at this height is not very rapid ; hence it remains to be proved whether a rotation of 20 years is sufficiently long to yield fair sized fuel.

Alternate compartments are worked in succession, so that the intermediate compartments may afford protection against wind,

frost, &c. and a shelter belt has been preserved along the top of the ridge. Snow is to be feared at this elevation, and we noticed the effects of the late severe winter in the breaking off of the young coppice shoots with the bark of the stool attached.

The standards have been well chosen and are uniformly distributed, with straight stems, and fairly broad, symmetrical crowns which will now expand owing to more room.

Felling, cutting and stacking are done by contract at Rs. 2 per 100 st. c. ft., the contractor being bound to cut below 6 inches from the ground; the stools are afterwards dressed by daily labour. Only stools of a foot in diameter or less are dressed. The experiment of ringing stools of large trees, instead of dressing them, has been found unsuccessful and therefore abandoned.

It does not pay to carry the small branch wood to Chakrata, and anything under 2 inches diameter is left on the ground. In some places these branches are lying on the coupe in deep masses, not only injuring the shoots, and preventing their growing up, but also preventing the germination of any seed that may be shed. In all our Indian coppices, at some distance from the market, this disposal of the branch wood is a matter of serious difficulty, and merits more attention. Fortunately, in a damp climate, the material soon rots, but not before it has had time to injure the stools.

It is important to notice that the compartments above the road are being worked first, and then will follow those below the road, so that no damage will be done to coppice shoots by logs, trees, &c., falling down on to them from above.

The following table shows the yield of the compartments already cut over:—

No. of Comp.	Date of cutting.	Area in acres.	No. of standards left.	Outturn in stacked c. ft.	Outturn per acre st. c. ft.	Average length of last year's shoot.	REMARKS.
2	Nov. 1889	2.5	30	9,700	3,880	4"	
4	Nov. 1890	2.75	50	11,640	4,214	10"	
6	Nov. 1891	4.5	65	11,985	2,663	8"	
3	Nov. 1892	2	50	*5,500	*2,750		*Estimated.

The trees which are being felled now are clearly very much older than 20 years, and it is certain that the yield at the beginning of the next rotation, will fall far short of the present yield which averages up to date 3,382 st. c. ft. per acre. Karshu acorns have been dibbled in some of the compartments already worked over, and have come up successfully. There are so many old stools which produce no shoots that it is obvious something of this kind must be done.

(To be continued.)

Forest Administration in the Central Provinces.

In the last October number of the *Indian Forester* there appeared an article setting forth roughly the "present forest administration of the C. P."; and making certain remarks with reference to "impending legislation." This article was written at a time when the Local Government had fully convinced itself that some alteration had to be made in the present administration; and, taking up its stand on the hardships of the agriculturists, and the "Zulum"—to use a well-known Anglo-Indian term—of the Department, it was ready to clutch at any straw, provided it could say that something had been done.

Under these circumstances, there was a fear—a great fear—that the popular cry of the uninitiated for "Commutation" should be accepted. But, as was pointed out on page 418 of the *Indian Forester* for November, 1892, this proposal "which would surely have been a step backwards instead of one of progress" was repeated by the Chief Commissioner.

Since that time much has happened. The reign of Morpheus has truly passed; and we are now in the midst of the greatest revolution the forest administration of this or any other Province has ever witnessed. In one half of the Province only—to quote the words of those in authority—"over 1550 square miles of forests will thus shortly be provided with working plans"; actual compilation of the plans being completed by about this time next year.

With reference to the introduction of this scheme I have recently had an opportunity of perusing a most interesting note relating solely—as far as statistics are concerned—to the forest area of the Northern Circle; though, as far as the scheme is concerned, it is to be applied without modification both in the the Northern and Southern Circles. I had hoped, before this, to have read an account of this revolutionary undertaking in this Magazine: but as nothing has yet appeared, the following notes which I have been able to collect, may be of interest to the readers of the 'Forester.'

I will begin by giving a few statistics, relating only to the Southern Circle, which will aid materially in arriving at an understanding of the scheme; after which, a short account of the scheme itself will follow.

As a preliminary, it may be of interest to note that the half of the Province forming the Northern Circle, occupies an area of 10,079 square miles, including forest land and cultivation; and this country is inhabited by a population of 3,476,595 souls, as returned at the last census. Now, the area of the Malguzari and Zemindari or Proprietary Forests, situated in this tract, is given as 11,014 square miles; so that, supposing the inhabitants to be solely dependent on the private resources of the Province for their forest requirements, it would follow that 1·4 acres per head of population would be available.

Dr. Schlich in his book on Forestry, has stated that for a nation 1 acre per head of population is a sufficient area of forest to meet the requirements of the people. Consequently it would appear that the people are independent of Government Forests. There is reason to believe, however, that the above figures do not in reality express the wooded private areas—that is to say, that in the above figures the word forest must be taken in its very general and widest signification; and not in the sense, of “woods.” And as will be seen from figures given below, there is a decided demand on the Government forests.

Let us turn now to the Government Forests. The total area is given at 10,079 square miles, which is made up as follows:—

Fire—protected and closed forests	2,822 sq., miles
Area to be excised from Govt., forests	2,249 „
Open forests	5,008 „

Total 10,079 sq., miles.

Deducting the area which is shortly to be excised, it follows that 7,830 square miles is the area of Government forests which will be permanently retained by the Forest Department of these Provinces.

Of this 2,822 square miles is the area of Closed forests * and the remainder 5,008 square miles, constituting the open forests, in the area to which the scheme to be described is to be applied.

This area of 5,008 square miles is not, however, wholly wooded and it is estimated that 45% of the total area consists of blanks. From which the following is deduced:—

Area of open forests	5,008 sq., miles
Deduct area of blanks	2,253 „

Wooded area 2,755 square miles.

Now, in this area of 2,755 square miles, 1 gather that 4 valuation Surveys by cutting over a total area of 195·5 acres, were carried out with the following results per acre, after leaving 80 standards:—

Produce.	Valuation Survey.			
	I	II	III	IV
	in tons	in tons	in tons	in tons
(a) Timber	2	1	} 6	} 47
(b) Fuel	7	6·24		
Total	9	7·24	6	47

* For definition of “Closed” and “Open” forests, *vide* pages 375 *Indian Forester* for October, 1892.

These results would give an average of 6·7 tons of wood to the acre.

And, therefore, for the purpose of Working Plans, the following average is accepted, after leaving 30 reserves to the acres :—

(a) Timber	...	...	1 ton
(b) Fuel	...	...	4 tons
Total per acre			5 tons

Accepting this average yield as correct, we arrive at the result that on the 2,755 square miles forming the wooded portion of the "Open Forests" the following is the stocking :—

(a) Timber	...	...	1,763,200 tons
(b) Firewood	...	...	7,052,800 "
Total			8,816,000 tons

Now, as to the consumption from these forests, as calculated by the registered sales of the previous year 1891-92, the following is the result :—

(a) Timber	...	...	11,352 tons
(b) Firewood	...	...	47,816 "
Total			59,168 tons

Or, reducing this to acres, at 5 tons to the acre, we have that the area to be cut over yearly to meet the demands is equal to 11,834 acres, as compared with 1,763,200 acres of well stocked forest available.

Having said so much by way of preface, it is now time that we turned our attention to the details of the scheme itself. Roughly speaking, it may be stated that the usual practice in preparing Working Plans is to start with a forest—that is with a tract of wooded country of given area; then to divide this area into blocks and compartments; then to fix the rotation; then to determine the yield per acre, and finally to fix the annual cuttings. In the Central Provinces, however, this procedure is to be completely reversed. Above, we have shown that the consumption from the forests of the Northern Circle during the year 1891-92, was equal to 59,168 tons, this quantity being the registered consumption during the year 1891-92, for the whole of the Northern Circle, which is divided into 8 Forest Divisions; these again being divided into so many Ranges. So that the consumption from the Government Forests of each Division, and of each Range is known. Further, in each Range there are a number of licensed vendors whose duty it has been to sell licenses at fixed rates per cartload or headload to the people requiring forest produce, the purchasers being permitted to cut and remove the same from any part of the forest served by a particular license vendor. It follows that not only is the total sale of forest produce per annum from each license vending station known, but also the quantity of produce removed from the heart of Government forest land, for the

extraction of produce from which licenses were sold at a fixed license vending station.

Now, this knowledge may be called the foundation stone of our scheme ; for, not only does it aid materially in determining the number of working circles which are to be established in any Range, the working circle being so fixed and in such number that no inconvenience is to be caused to the people in carrying produce removed from the annual cuttings, for long distances to their homes ; but this knowledge is indispensable for determining the size or area of annual cuttings, and of working circles, in a manner which will now be described.

For the purpose of introducing this new scheme the first thing to be done is to determine the annual yield which is required from a particular tract of forest—that is to determine the consumption in tons during the year 1891-92 from this tract. This information in cartloads and headloads, is obtained in the manner just explained from the license vendor, who has been selling licenses for that particular tract ; and on the assumption that 1 ton = 3·8 cartloads = 36 headloads, the tonnage follows.

The yield which the annual cuttings of the working circle, which it is proposed to establish in a part of a Range, that is, the registered quantity yearly consumed in the tract having thus been fixed, it has been thought expedient to add to it 50% “to meet the ‘more than probable increasing demands which are certain to be ‘made on the forests if the selling rates are lowered.” And now by dividing the resultant figure by 5—(i.e. 5 tons, the average stocking of the open forests of the C.P., as above explained)—the number of acres of wood which require to be felled to yield the estimated out-turn is determined.

The next and final step, the fixing of the working circle, is quite as simple. It has been shown above that “45 per cent of the total area of the open forests consists of blanks” consequently as the rotation is fixed at 30 years for the following reasons, namely, “that the coppicing faculty of the several species to be dealt with is ‘not lost but is well maintained within that age even extending up ‘to and beyond 50 years in most species. Teak coppices fairly well ‘up to 50 years ; so do sal, lendhya, mohwa, sirioa and numerous ‘others which yield valuable timber and other products” ; the idea being to produce poles from 9 to 12 inches and up to 18 inches girth, such poles “being in greatest demand by the people, as ‘with them they build their houses, fence their fields, and ‘employ them as supports for sugar-cane crops”—it follows that by multiplying the number of acres thus found by 54·54, (i.e. $1 \times 818 \times 30 = 54 \cdot 54$), the area of the required working circle will be derived.

The following example will, perhaps, best illustrate the method :—

Suppose that the registered consumption of wood for the locality in the years 1891-92 was 10 tons, 50 per cent added would

raise this to 15 tons. The required area of forest expected to yield 15 tons or the average rate of 5 tons per acre will be 3 acres, then 3 multiplied by $54 \cdot 54 = 163 \cdot 62$ acres will be the area of the Working Circle.

The area of the required Working Circle having thus been fixed, theoretically, it is in the next place to be laid down, practically, on the ground—a portion of forest of the required area of the Working Circle being carved out from the existing forest area. This being done it only remains now to say a few words with reference to the method of treatment and the method of conducting the fellings. From what has already been said it will have been gathered that the “method of treatment” or sylvicultural system is to be that of coppice with standards, the number of standards being fixed at 60 to the acre, besides all trees having a circumference area of 3 feet. The rotation, for reasons above given, is fixed at 30 years.

As to the method of conducting the fellings, the period of 30 years is to be divided into 2 periods of 15 years and the fellings will be conducted on the method of strips, 5 chains broad, and not more than 20 chains in length, the trees on every alternate strip being left standing, each strip and alternate belt of trees thus being of equal width occupying equal areas. That is to say that perfect parallelograms 5 chains broad, 10 to 20 chains long, are to be laid down on the ground, and cut alternately. The entire area of the Working Circle will thus be gone over during the first 15 years, and in the 16th year the fellings will recommence, the alternate belts being then felled—and so on to the 30th year.

In conclusion it is only necessary to say a few words with reference to the effects of this new scheme in upsetting the old system of management. In the old days the person requiring a forest produce had merely to purchase a license at the nearest license vending station and armed with his license and his axe he had the run of the whole forest wherein to satisfy his desires. There was practically no check and certainly no system.

By the introduction of the new scheme above described all the Government forests will be closed and reserved, with the exception of the annual cuttings, that is the strips which are to be annually felled and from which alone green wood is to be obtainable: the license vendor residing on the site of the cutting area, in order that no great inconvenience be caused to the people dependent on the Government forests, their produce for the annual fellings are to be fairly close together; and in fact the number of working circles which have been established in the different Forests Divisions would appear to vary from 30 to over 60. For these, working plans are to be prepared at once, and in the words already used above, over “1,550 square miles of forest will thus ‘shortly be provided with Working Plans’”; “the actual compilation

of Plans being completed by about October 1893. Thus we have to contemplate the following mysteries. To begin with, a Province, which has an area of Government Forest equal to x acres which have been worked for over 30 years without even the elements of a Working Plan being thought necessary; though a consumption of about y tons has been the average yearly quantity of material removed from these forests, the whole of this produce having been extracted at the will and pleasure of the purchaser from any part of a Government Forest without let or hindrance: suddenly, in a single year, from the Government forests of this Province not a single stick will be removed except in accordance with the provisions of a Working Plan.

In this article, only a rough description of the scheme which is now, it is understood, in working order, has been given. Details have been omitted, as being, perhaps, tedious and unnecessary to the understanding of the scheme itself. Similarly, all criticisms of the scheme have been avoided: though both these matters might well form the subjects of special articles.

TUSCAN.

Forest Conservancy in the Catchment areas of tanks.

An interesting discussion has lately taken place on the advantages and disadvantages, from the point of view of water supply, of fostering woody and herbaceous growth in the drainage area of the Danta tank in Ajmere, where the climate is dry, evaporation great, and the rainfall slight and uncertain in its character. It has been found impossible, in this case, to arrive at fairly reliable conclusions; but the general question does not appear, in India at least, to have ever been systematically investigated. Should any of our readers have had special opportunities for observing how forest conservancy in such a climate affects, in loose dry soils, the retention of water on sloping ground, the record of their views in this journal would no doubt be of advantage in elucidating the question.

The tank alluded to was completed in 1878. It is situated among low steeply-sloping hills in a very dry climate, the average annual rainfall being about 16 inches. The drainage area extends over about 3 square miles, the whole being a rocky basin, covered thinly with a light sandy soil. The vegetation, when protected, is of the poorest kind—low stunted trees or shrubs, with grass, much of which disappears in seasons of drought. The forest growth in the catchment area was first conserved in 1880, and has since been uninterruptedly protected. Conservancy was undertaken because

it was confidently expected that, not only by this means would the silting-up of the tank-bed be impeded, but, more especially, that the brushwood and grass would enable a greater percentage of the total rainfall to reach the reservoir, by diminishing evaporation and by causing water to flow off the slopes less rapidly and to continue flowing for some time after the cessation of rain. The assuring of a slow and continuous flow, provided that the total in-take of water in the tank is not thereby much reduced, would be, in this case, of special importance, as evaporation from the tank surface is probably greater than when the water is flowing towards the reservoir. In 1892, however, after 12 years of forest conservancy, it was reported that the tank had dried up, and it was proposed to permit thenceforward unrestricted grazing and the cutting of bushes during the greater part of each year in the area drained by the tank. It was argued that the effect of forest conservancy was, by retarding the flow into the tank, to increase the loss by evaporation. This argument was founded mainly on the accepted fact that, in previous years, the tank had only been filled after very heavy rainfall. No proof was adduced that the in-take of water would have been greater had the vegetation not been protected ; but it was roundly stated that the drainage area would be best adapted to its requirements were the whole surface covered with a smooth impermeable substance, such as asphalt. Before coming to a conclusion, the local authorities undertook a further enquiry as to the circumstances of the reservoir, and the effect which the presence or absence of forest growth has on the quantity of water actually becoming available in that and other local tanks similarly situated. The result of this enquiry is that data are not available on which the matter can be set at rest. The various officials consulted are fairly evenly divided in opinion : some considering, for instance, that, when the rainfall is slight, the water has a better chance of ultimately reaching the tank if the vegetation on the hill slopes is protected ; others condemning forest conservancy as an unmixed evil from the point of view concerned. The course finally adopted has been to defer the settlement of the question for a short term of years, during which the quantity and character of the rainfall and other particulars will be systematically observed and recorded. Although the discussion has been hitherto to a great extent based on academic considerations, it has raised an interesting question which, in some localities, must be of considerable economic importance. There are many localities in Southern India which must be very similar to that in Ajmere, where tanks surrounded by hills which have been taken up as Reserves might be expected to give information. Most especially are such localities common in the Ceded Districts and we hope some of our readers in those Districts will give us their experience. And as regards the Danta tank, the results of the experiments to be undertaken will influence the solution of similar problems in various parts of India.

Charcoal for Iron Smelting.

In the annual report of the Geological Survey of India for 1892 it is stated with reference to the iron-ores of Southern India that the question of the successful development of the enormous iron-ore deposits of the Salem District becomes eventually a forest problem, as there is no coal in the district and no immediate prospect of profitably using for this purpose, on account of heavy transit charges, the coal raised in other Provinces. It may be urged that it by no means follows that because an iron industry cannot be developed owing to the costliness of coal, charcoal can therefore be made available at a sufficiently low-cost to float the industry. But it certainly behoves the Forest Department to put forward such a report of its resources, and possibilities, as will distinctly show to what extent, both as regards material and as regards cost, it can contribute towards the utilization of the ore.

In view to this, the first information required seems to be a reliable statement of the quantity of charcoal required to produce a ton of iron. Such authorities as Sir Dietrich Brandis and Dr. Schlich pronounced this to be $2\frac{1}{2}$ to $3\frac{1}{2}$ tons, and their statements, have so far as we know, remained unquestioned, up to the appearance of a letter in the *Pioneer* by Mr. Charles McMinn, dated 20th March last, in which it is said:—"In the Blandfer furnace, writes 'Greenwood, page 134, the consumption of charcoal is $16\frac{1}{2}$ cwt. per ton of pig produced." The actual experience of our readers is earnestly sought in order to reconcile these different authorities. Our limited acquaintance with the subject of iron smelting goes to show that in a rule of thumb sort of measure equal quantities by weight of ore and charcoal are used, and that it is more likely that $16\frac{1}{2}$ cwt. of charcoal are consumed in a Blandfer furnace to smelt a ton of ore, than to produce a ton of iron.

Then comes the question of the yield of the ores. In Watt's Economic Dictionary, we find that Salem magnetite containing 17 per cent. of metal yields by the methods in vogue only 15 per cent. Can 50 per cent. be obtained from the richest ores with an expenditure of charcoal of two tons to one ton of iron produced? Or can better or worse results only be obtained?

With further reference to Mr. McMinn's letter above quoted and which is reproduced below* it may be safely asserted that the constituents of wood absolutely dispose of the matter of obtaining by any process of carbonisation more than 25 per cent. of the wood by weight in charcoal. The usual result, under favourable conditions, is 21 or 22 per cent. of charcoal.

Finally, it may be said that the yield of forests so differently situated as those of Madras and Russia can scarcely be compared. Full complete forests in Europe may produce a ton per acre per annum, and we have forests in India which produce that amount,

such as our richest and best stocked Sal forests of the Himalayan Terai, but whether the forests of Salem or the Boswellia mixed forests of Central India actually produce one-half or one-tenth that amount of wood is for our readers in those localities to show, and we trust they will come forward and clear up this point.

The charge made against the department in regard to its *cherished wood* may be dismissed with the remark that the department is ever ready to find an outlet for its products at a profitable rate. If Metallurgy or any other industry can offer value for wood either at present existing, or to be grown in the future, the financial and commercial abilities of the Forest Department which have always been rated highly, will not fail to meet such an offer in a liberal and business-like way.

H.

*IRON MANUFACTURE IN INDIA.

TO THE EDITOR.

SIR—From the threepenny handbook of commercial products, No. 8, Iron, published by the Government of India, I learn that Government officials seem to be labouring under erroneous ideas touching the effects of iron working upon forests. We are told at page 14, apparently on the authority of Sir Dietrich Brandis, that 10,000 tons of iron require 33,000 tons of charcoal, to be produced from 140,000 tons of wood, which, at the rate of half a ton per acre of annual yield, require 280,000 acres of forest. During a long career of respectful criticism of official literature, I have ever submitted that Indian officials will make grave mistakes and fall into perilous delusions if they refuse to peruse and digest the non-official literature of their subjects. Now we can understand from these figures why the Indian Forest Department has, though graciously disposed, still hung back when asked to make concessions for iron manufacture. Twenty-eight acres of forest for each ton of pig! So far as I can judge from the authorities within reach, each one of these three statements largely underestimates the productive power of each several factor. We are told that an acre of forest only produces half a ton of fuel annually, that eight acres will be required for one ton of charcoal, and three and a half tons of charcoal, or twenty-eight acres, for one ton of iron. The best authority on the subject, Jeans, states that each blast furnace requires at least 20,000 acres of forest for fuel in Russia—see page 262—and every modern blast furnace turns out 10,000 tons per annum as a minimum. In the Blandford furnace, writes Greenwood, page 134, the consumption of charcoal is 16½ cwt. per ton of pig produced. As for the half ton of wood per annum per acre, when root crops at home yield 10 to 50 tons, I am silent. Dr. Schlich—see article Charcoal, Watt's Economic Dictionary—though himself a forester anxious for his charge, estimates the charcoal required per ton of iron at 2½ not 3½ tons. At any rate, if 20,000 acres of forest suffice in Russia and India, where reproduction is far more rapid, a much smaller area should be ample. Years ago, I pointed out in your columns that the best Jabalpur iron was made with bamboo and Boswellia, which were waste products over vast areas of our forests. I submit that the statistics circulated by Government in the threepenny handbook are calculated to discourage Indian metallurgy, though probably the intention of its author was quite the reverse. Of course the Forest Department will be hostile when told that 280,000 acres of their cherished wood are wanted for each blast furnace; they would be friendly, probably, if informed that 10,000 acres was, at any rate, much nearer a sober estimate.

CHARLES W. McMINN.

II.—CORRESPONDENCE.

Deodar in Kulu.

SIR,

I have read with much interest your correspondent's letter on "Deodar in Kulu" contained in the Indian Forester for May, 1893 and beg to make the following remarks on some of the points discussed in his paper. I am glad to note the great importance placed by your correspondent on the element of shelter, and I also am of opinion that too much stress cannot be placed on this important condition. In my opinion (based on 10 or 12 years' experience of Deodar planting and sowing in the Himalaya) it is almost useless to attempt to grow Deodar successfully on bare hill sides out in the open, but where shelter is available, even though the soil is poor, the successful planting and sowing of Deodar is generally successful. The first thing to be done in the case of the treatment of bare places is to get up some kind of shelter either from Blue Pine (*Pinus excelsa*) or such bushes as *Indigofera*, *Desmodium*, &c., under whose fostering care there will be no difficulty in inducing Deodar to grow. The lateral shelter of old Deodars and of Oaks and other trees is also good when available. In all Deodar planting work and in fact as a general rule, with regard to all planting operations in this country, another great secret of success lies in using good, strong nursery plants, not less than 10 inches high, and which have been transplanted at least twice in the nursery beds before removal to the Forest. In the case of Deodar, these can be planted during the rains with or without balls of earth, but the planting work should all be completed by the middle or at the latest the end of July so as to give the plants a fair chance of establishing themselves before the rains are over. A system of transplanting Deodar in baskets has been lately introduced into this Division by the Conservator and which, though slightly more expensive than the old plan of planting out direct, has the advantage of ensuring almost complete success. This plan may be described as follows:—

When the young Deodar plants are 18 months old and after having been pricked out once in the nursery beds after 6 months, they are transplanted during July into Bamboo or Ringal baskets 8 inches by 4 inches and placed in a shady place in the nurseries. These are occasionally watered during the autumn and are ready for planting out during the succeeding March and April, when just 2 years old, by which time the roots begin to appear outside the baskets. The baskets soon rot, the plant establishes itself at once

and very few failures are the result, probably not more than 5 per cent. As in Kulu, so in Jaunsar, there was a splendid crop of Deodar seed during November 1892, and this has resulted in a magnificent crop of seedlings wherever suitable conditions exist. Your correspondent altogether condemns sowing of Deodar *in situ*, but I may say that some success has been obtained with sowings in patches and pits in the forests of this Division, wherever the conditions of soil, aspect, elevation and shelter were favourable. One advantage is that the system does not cost much, and in a good seed year, one can often use up a quantity of seed which could not be otherwise utilised. I quite agree with your correspondent in his remarks about the trifling damage done by limited cattle grazing in Deodar forest, and have often noted that a much better crop of seedlings is generally forthcoming in lightly grazed areas than in the strictly closed and fenced forests. Goats and sheep undoubtedly nibble the Deodar seedlings and as they do not assist in breaking up the turf, these animals should not be allowed in to browse in any Deodar forest under reproduction. The damage done by Buffaloes is also considerable, as they trample down the seedlings and knock about and bark the saplings with their horns, so they too should not be allowed in young Deodar forests but with cattle I consider a moderate amount of grazing an advantage.

E. Mc. A. M.

An important question of Forest Law.

SIR,

Will some of your readers learned in Forest Law give us their valuable opinion, or others who may have tested the point their experience, in regard to the enforcement of the obligations imposed by Sec. 78 of Act VII of 1878 (The Forest Act)? Sec. 78 requires that certain persons shall furnish information respecting the commission of Forest offences, and also render assistance in certain cases, when called upon; but it specifies no penalty or punishment in the event of neglect or refusal to fulfil the obligations.

The question has arisen whether the non-fulfilment of these obligations is punishable at all, and if punishable, whether it can be dealt with under the Forest Act or under the Indian Penal Code.

Various arguments have been advanced, and views expressed tending to show that the failure to furnish information, or to render assistance must be held to be an 'offence'; but these still need the confirmation, so far as we know, of a conviction under either Sec. 65 of Act VII, or Sec. 187 of the Indian Penal Code, which shall stand the test of Appeal to a higher Court.

Pending such authoritative decision by the Courts, it seems to us that the non-fulfilment of the obligations imposed by Sec. 78 may be fairly treated as a 'Forest offence', for, if it is not a 'Forest offence', it would appear not to be an offence at all, which

would seem absurd, and to exempt it from the provisions of Sec. 187 of the Indian Penal Code. In this view the 'offence' could be compounded by a Forest Officer specially empowered under Sec. 67 of Act VII or it could be punished under Sec. 65 of the same Act.

At all events, where the offender is willing to compound, the use of Sec. 67 would seem to be unobjectionable, since in the event of his refusing to pay compensation, he can be prosecuted under both Sec. 187 of the Indian Penal Code, and Sec. 65 of Act VII.

H.

Results of Eucalyptus cultivation.

SIR,

Since the fiftieth year of this century and during several years' field studies before that time, I have exerted myself for the introduction and extensive cultivation of the *best* species of Eucalypti as adapted for various regions of the globe, not only through the elaboration of extensive works but also by distributing select seeds of the various specific trees, as well for industrial, as for sanitary purposes. Late in life, it would be a pleasing satisfaction to me, if I could learn of particular successes anywhere in these rearings, so largely called forth by myself without personal advantages of my own.

As regards Continental India, I am aware that the Eucalypti have become of extraordinary value; also in the Peshawar and Lahore Districts they have proved useful to subdue fevers and to provide timber and fuel; so, it would probably be of great interest and serve further useful purposes, for those living far away, if some detailed information could, in reference to your provinces, be afforded through your excellent periodical, which valuable publication I regularly receive through your generosity. May I also draw your attention on this occasion to the immense successes attained in many tracts of South Africa right to the Transvaal, with two of the principal Australian bushes mentioned in my "Select Plants" as particularly recommendable, namely, *Atriplex nummularia* and *A. halimoides*, which perhaps are also now gregariously naturalized in the Punjab and Peshawar.

My Iconography of Australian Salsolaceous plants (quarto, 96 plates) will doubtless be accessible to you.—A rather full account of the pastoral rearing and spreading of the two mentioned Atriplices is given in one of the last numbers of the Agricultural Journal of Cape Town and by the venerable and erudite Professor McOwan, who alludes to the intelligent and zealous co-operation, so far, of numerous South African Colonists.

MELBOURNE,

June 24th, 1893.

Respectfully yours,

FERD. VON MÜLLER.

The Departmental Blazar.

SIR,

'G. R. L.' cannot read his *Forester*, if he is dependent on the *Pioneer* for all he knows of this subject. There are two courses open for the adoption of a blazar, *viz.*, the publicity of the *Forester*, and the endeavours of a private individual. I did my best in the latter way in Bombay, with the results reported, which are too discouraging and long drawn out to induce me to proceed further.

'White Flannel's' letter again, seems to have been written before perusing mine of the previous month. I do not know what right he has to say that any considerable number of officers are opposed to *any* Blazar. My impression is that they are a very small minority. Nor do I know that their objection is worth any consideration, since they have only to abstain from wearing it, and the fact of my behaving differently cannot hurt them anywhere.

I again enter my protest against Coopers Hill colors. We are *not* Coopers Hill men and P. W. D—ites, and 'White Flannel' will have to wait a good bit yet before Coopers Hill will represent "the *élite*" of the Department. Nancy men and Germans will be going strong for many years yet, and they are all above Coopers Hill. I also again protest against any commonplace stripes of two raw greens, like the Burmah colors, and any rifle-green self colors, (unless with an adequate distinctive binding) for the reasons already given, *viz.*, that half the "Arrys" about town have green or green and white stripes; and rifle green, besides fading badly, is already appropriated by probably several rifle regiments, &c. We can surely combine neatness with distinctiveness. I cannot say that I see much hope of *any* blazar being adopted myself.

VELLEDA.

Note.—We are afraid we must agree with the last sentence. In reply to our enquiries, we have only received *seven* answers, they will be reported in due time.

J. S. G.

A Bureau de Recherches.'

Last month we published a letter from our correspondent 'T' on this subject, but we had not sufficient space to thank him for his good wishes on behalf of the *Indian Forester*. and to point out, as we feel we ought to do, that we are not so deserving of compassion as he is good enough to think. So long as he gets plenty of good original papers, the work of the Honorary Editor is not very heavy and indeed comes to little more than the making up of a number and the passing of the proofs. In this latter work, brother officers in Dehra are kind enough to assist, and if the material is abundant and help is forthcoming for the reviews, the editorial work of the *Forester* is not very great. It is when contributions fall off and the editor has to go to work to supply the amount of manuscript necessary to make up about the usual

40) pages, that his worry begins, and therefore we hope that Forest Officers, who read this, will assist by sending us more original work. We badly want more 'sylviculture.' The late M. Puton told a former Honorary Editor that he was surprised that we had so little sylviculture in our pages; and we ourselves, in spite of the apparent endorsement of the charge by the former Editor, wrote to M. Puton and explained to him that the Department was still in the beginning of its work; still tied down largely to the selection, demarcation and settlement of forest estates; still trying to combat old prejudices in respect to shifting cultivation over-grazing, wasteful cuttings and fire; and that with all this it was creditable that as much sylvicultural information had been collected as was already on record.

We disagree with our correspondent in regard to making the *Indian Forester* a 'state concern': we much prefer it as it is at present, an independent departmental journal, free to discuss the Forest topics of the day, within the bounds of what is obviously due to the Government to which its Editor and chief contributors belong, and supported by Government to an extent which assures its permanency so far as finance is concerned. But we are delighted with the idea of making the *Indian Forester* what it tries to be and ought to be, the 'Bureau de Recherches' of the Department. If those who have observed anything that is not generally known, would send it at once and not wait or say to themselves, as our first Honorary Editor put it in his Preface of July 1875, "I did not think 'you would care about it; I thought it hardly worth sending'" we should be able to record many very important and very useful facts and observations, and this we take it, is what 'T' wants us to do.

'T' says that it 'depends on personal whim whether or not' contributions are published" and to this we must demur, for we are not aware of ever having rejected much at all and certainly only things which did not seem really suitable. We have, of course, to edit! that is the function of an editor: but our editing has never been of a very strong character and we are not aware that personal whim has ever had any influence on it. Financially, we are glad to say, the *Forester* does well enough, thanks to the recent influx of many new subscribers.

We may conclude this, by again making an appeal for more contributions; we can enlarge the journal if it is necessary to do so, but we feel that the real want is more original matter and that in that original matter, Forestry in its less wide scale, that is, Sylviculture, Utilization and Working Plans should find the chief place. And we would ask for more 'Shikar and Travel.' It would not do for our Journal to be 'all jam' but a little jam in each number is, we are sure our contributors and readers will agree with us in thinking, a pleasant addition to a bill of fare which must occasionally be rather insipid.

III.—OFFICIAL PAPERS & INTELLIGENCE.

The Charduar Rubber Plantations in Assam.

We have received from the Government of India a copy of a report on the Charduar rubber plantation which had been called for by them in their review of the Assam Forest Administration Report for 1891-92. We quote the following extracts from it.

“The plantation which was commenced in 1873, had up to ‘February 1884 report, been successfully carried out over 892 ‘acres at a cost of Rs. 64,351’ or Rs. 72, per acre. The question then arose whether the undertaking should be continued or ‘whether it would not be better to stop further extension.

‘Mr. Mann considered he could prove the work to be financially a paying one, and recommended a yearly extension of 200 ‘acres. He estimated that a rubber tree became mature for tapping purposes at the age of 50 years, that 5 seers of rubber could ‘be obtained from such trees for 16 successive years, and that 10 ‘such trees would stand on an acre of planted land. That each ‘tree, therefore, would yield 2 maunds, and each acre 20 maunds ‘of rubber worth Rs. 54 per maund, or Rs. 1,080 per acre, as ‘against an expenditure of Rs. 72 per acre for formation and ‘up-keep. Even had this latter sum been increased by compound interest at 4 per cent. which would have brought the ‘original outlay up to about Rs. 511 per acre at the end of 50 ‘years, there would still remain a large margin for profit according to the above estimate.

‘The Chief Commissioner, Mr. (now Sir Charles) Elliott, did ‘not take the same high view of the financial prospects of the ‘plantation, and was of opinion that, except for the purpose of ‘carrying out further experiments, no extension should be made. ‘He considered the Forest Department had proved how the rubber ‘tree could be most successfully propagated, and was of opinion ‘that the further development of the industry should be left to ‘private enterprise.

‘The Government of India reviewed the whole question, ‘and eventually decided that, as the financial prospect appeared ‘favourable, as there was no immediate prospect of private capital ‘being invested in the industry, and as there was every probability ‘of the rubber supply being gradually exhausted, it would be wise ‘to extend the plantation by 200 acres per annum. It was also

ordered that certain tapping experiments should be carried out with the view of testing further the probable financial results, and that the planting of *Ficus elastica* as an epiphyte on other trees should be undertaken on a larger scale than heretofore.

Work was, therefore, continued, although not on the scale of 200 acres a year, owing to financial pressure. An attempt to establish the plant as an epiphyte on about 50 acres was unsuccessful, and in 1889, when the Inspector General of Forests visited the province, the plantation contained 1.043 acres of established trees, which had cost Rs. 85,582, or Rs. 82 per acre.

In the report which followed the Inspector General's inspection of the Assam forests, it was again recommended that this annual extension of 200 acres should be proceeded with, which was accordingly done, with the result that at the close of the past financial year, 1892-93, the planted area has increased to 1,900 acres, and the expenditure to Rs. 1,23,700, or Rs. 65 per acre.

Work has been performed much cheaper of late years than formerly, which naturally is due to the experience gained by past failures, some of which were of an expensive nature. During the six years between 1887 and 1893, I find that keeping up the old plantation and putting out 860 acres of new extension (o. which a large proportion has been planted a second time owing to failures) cost Rs. 41,871, divided over the two heads as follows:—

			Rs.	Rs.
' New work	...	...	37,289	} 41,871,
' Up-keep	...	...	4,582	

I find also that, with six years' efficient protection, the plantation is rendered tolerably safe against everything but illicit tapping, the trees planted out in 1886-87 (compartment 18) being now safely established.

We may estimate, therefore, from the above six years' expenditure, that future work may be carried out and permanently established for about Rs. 50 per acre, exclusive of controlling expenses, as follows:—

New work	Acres	Rs. 37,289	= Rs. 43.36 per acre.
		860	
Up-keep	...	Rs. 4,682	= Rs. 5.32
	Acres	860	
		Rs. 48.68	
		Say Rs. 50	

It is now to be decided whether it will be financially expedient to continue the operation at the above cost, but the data

available for the proper discussion of this point are unfortunately still very meagre, although we have a little more information on one important factor of the calculation than Mr. Mann had when he wrote his report in 1884.

The three chief points on which information is required are :—

(1) Age of exploitable trees.

(2) Number of productive trees obtainable to the acre.

(3) Outturn of rubber per tree.

With regard to the first point, I am inclined to accept Mr. Mann's tree of 50 years as a mature rubber-yielding tree. The oldest portion of the Charduar plantation was put out in 1873-74, or 20 years ago, but the records prove that all the first compartments failed time after time, and were not really successfully planted until 1877-78, or even later. It is not likely, therefore, that the trees in the oldest portion are more than 15 or 16 years old. And yet they now average about 50 feet in height and 6 feet in girth. Such trees may, I think, fairly be expected to become productive in 30 more years or less.

The second point, regarding the number of trees likely to stand on an acre, is a doubtful one. Mr. Mann relied on obtaining 10 productive trees, and of course there would be no difficulty in obtaining this number in the plantation. But I feel a little doubtful that if 10 trees per acre are allowed to remain, they would ever attain the dimensions of the trees growing in the natural forests, or yield as much rubber as is obtained from those trees. For it has been found from measuring the lateral spread of 50 forest trees (see statement attached to this report) that such trees possess crowns 94 feet in diameter covering, on the average, 980 square yards of ground. Now our trees, until recently, have been planted out 100 feet \times 25 feet and are so crowded in the lines that it seems necessary to remove half of them in order to give the remainder more room for development. But, if half of them were removed, there would remain only between 7 and 8 trees per acre, and these trees would have only about 550 square yards of ground each, as compared with above 980 square yards covered by the forest trees.

This year a different system of planting has been introduced, the trees being put out 70 \times 35 feet apart. Eventually, if half of these be thinned out, there will remain about 9 trees per acre, each covering 544 square yards of ground. Practically, however, we do not yet know what the future condition of the plantation will be, or by what method, if any, thinnings should be carried out in the present standing crop; and it is difficult, therefore, to anticipate the number of trees of 50 years old that will be left standing on an acre. But, for the purposes of this calculation, I will assume that 8 such trees may be relied on.

'Then in regard to the third point, having reference to the outturn in rubber obtainable from a mature tree, Mr. Mann, in his above-quoted report, calculated that a tree would yield an annual outturn of 5 seers of rubber for 16 successive years, or a total outturn of two maunds. His calculation was based on certain tapping experiments that had been carried out on 50 forest trees in 1882-83 and recorded as an Appendix to the report for that year. These experiments were carried out very carefully under the supervision of the divisional officer for six years. The trees were selected as not having been tapped before, or as having recovered from former tapplings. They were not tapped lower than 4 feet above ground, the branches were not tapped at all, and the main axis was tapped at intervals varying between 2 and 4 feet apart. The first year's tapping, on which Mr. Mann based his calculation, yielded an outturn of 5.60 seers of rubber per tree. But, as will be seen on reference to the statement attached to this report, this yield rapidly declined, and the annual tapping of the trees soon caused considerable damage.

' In the first year the yield was 5.60 seers per tree.					
'	"	second	"	1.06	" (bad season).
'	"	third	"	2.56	" (good season).
'	"	fourth	"	3.43	" (includes yield of 2 new trees).
'	"	fifth	"	1.06	" (season good).
'	"	sixth	"	.91	" (season good).
				2.43	
' Average				2.43	

'Instead, therefore, of yielding 5 seers per annum as was anticipated, these trees, which had been most carefully tapped, yielded 2.43 seers during the six years they were worked. Moreover, out of the 50 trees originally selected, 6 deaths had occurred.

' In 1884-85	...	...	1 tree died.
' " 1885-86	...	...	1 " "
' " 1886-87	...	...	2 trees "
' " 1887-88	...	...	2 " "

'And it is fair to suppose that, if tapping had been continued, all of these trees would have died in the course of a few more years.

'So far, therefore, as the experiment goes, it certainly tends to prove that no large yield can be obtained from ordinary single trees, and that even moderate tapplings, if carried out annually, soon destroy the tree. Mr. Mann's calculation of outturn must, I think, be looked on as much over-estimated. One has heard, it is true, of trees said to have yielded a maund of rubber in one season's tapping, but the information is not exact, and the results of the above experiment seem to forbid any such expectation. We seem to be nearly as far as ever from finding out what the real outturn of a mature tree may be.

' It appears to me, however, that the chief mistake made was in thinking that the trees could be tapped year after year without the outturn becoming reduced in quantity. The mere fact of taking 5 seers of rubber from a mature tree would probably not injure this latter, provided a sufficient rest were given for recuperation, and it might then be possible to extract a further similar quantity without permanent injury to the tree.

' This period of rest, I believe, should be not less than 5 years, which time is required, I am informed, for the tapping scars to heal over. It then, might be, I think, possible (judging from the experimental tapping results) to obtain another yield of 5 seers. But how long this process of yield and rest would continue, must at present be quite hypothetical. For the purpose of this report, however, it is necessary to assume certain figures. Therefore, let us suppose that a tree 50 years old is capable of yielding 5 seers of rubber once in every 5 years, between the age of 50 and 100 years, or a total yield of 55 seers. Let us also suppose that 8 of such trees will stand on 1 acre of planted land, and that to establish 1 acre of such trees will cost Rs. 50. We may also, with much certainty, assume that a net profit of Rs. 50 per maund will be obtainable on the rubber outturn.

' The initial outlay of Rs. 50 will have accumulated to about Rs. 350 at the end of 50 years, allowing compound interest at 4 per cent., and against this expenditure all that we could hope to realise would be Rs. 50 every fifth year, or the outturn of 8 trees = 40 seers of rubber, valued at Rs. 50 per maund. This amount of Rs. 50 would not equal the initial outlay for the 'five years' period of rest calculated at 4 per cent., which, on Rs. 300, would be Rs. 65. It is evident, therefore, that no matter how long the tapping process could be continued, there would result an ever increasing debt against the plantation. Judged on purely financial grounds, the further extension of this operation is not likely to be remunerative.

' The Government of India may, however, think that, in view of the nearly certain exhaustion of the natural rubber forests within the next 20 or 30 years, we should be justified in forming artificial forests for the purpose of keeping up a supply of a very valuable and useful product, provided the actual outlay incurred on its production were certain to be recouped. According to the above figures this recovery of actual outlay, irrespective of interest, would be realised from the first tapping at the end of 50 years, after which the plantation might be expected to pay at the rate of Rs. 50 per acre every fifth year for the next 50 years. But, if this view of the case were taken, and it was desired to supply the market with as much plantation rubber as is now obtained from the natural forests, say 4,000 maunds per annum, it would be necessary to tap over 4,000 acres a year, and to have established a productive area equal to 20,000 acres.

' The Government of India in their instructions requested that the report should deal with the plantation from a technical as well as from a financial point of view. In this report I have confined myself almost entirely to the latter standpoint as being the more urgent, and because I freely confess that the future treatment of the plantation is as yet a puzzle to me. We have discovered how best to propagate the rubber tree, and can, I think, rely on being able to extend its cultivation successfully to any reasonable extent at a cost of Rs. 50 per acre, but we are at present doubtful regarding the best treatment for obtaining a final crop on the ground.

' Last season, with the view of thinning out the trees in the lines, we tried to tap every alternate tree to death, and carried the operation over the two first compartments. The tapping certainly looked sufficiently severe, the main axis and all main branches of the trees being tapped at short intervals. But I am informed by Mr. Copeland, the divisional officer, that the trees operated on, so far as their general appearance is concerned, are now not distinguishable from their untouched neighbours, and in this connection it may be interesting to note that at the last inspection of the Conservator it was discovered that the roots of the trees standing in the same lines and even in adjoining lines 25 feet apart showed a decided tendency to anastomose, so that, when exposed, the root system appeared as a continuous net work.

' If the roots of these plantation trees have really become incorporated in one system as suggested, it would perhaps explain why the tapped trees have suffered so little, because they have been sustained and nourished not only by their own channels of food supply, but also by those of their neighbours. On finding this out, the tapping operation was temporarily stopped; and, after consulting Mr. Gamble, of the Dehra Dun Imperial Forest School, it was decided for the present not to interfere with the apparently surplus trees, for it seems possible that a severe tapping operation, carried out on such trees, might have, to some extent, an exhausting effect on the adjoining trees which it is desired to protect and develop.

' The plantation will be carefully watched, and the technical report called for will be furnished when more information is available.

' It may be noted that the yield in rubber from tapping the 1,116 trees in compartments 1 and 2 came to only 3 maunds and 8 seers, or 9 tolas per tree.

' In conclusion, I beg to report that 150 acres of new extension having been prepared for planting at a cost of Rs. 1,800, I have authorised the Divisional Forest Officer to plant up this area at an additional cost of Rs. 2,000, and to suspend all further operations until orders are received from the Government of India'

Statement showing results of tapping certain selected rubber trees in the Balipara plantation during the six years 1882-88.

Year.	Number of trees.	Total yield in rubber.	Average yield per tree.	Total net profit realised.	Total loss.	Net profit per tree.	Net loss per tree.	Remarks
		Seers.	Seers	Rs.	Rs.	Rs. s. p.	Rs. s. p.	
1882-83 ..	50	281	5'60	261	.. .	5 13 0	....	Season favourable.
1883-84 ..	50	58	1'06	....	15	.. .	0 4 9	Season very unfavourable owing to constant rain.
1884-85 ..	{ Old 48 New 6	123 76	2'56 12'66	188	....	2 0 0	...	1 tree died. Season favourable.
1885-86 ..	51	175	3'43	Not stated			....	1 more tree died Season favourable. Only 2 of the 6 new trees tapped.
1886-87 ..	48	51	1'06	Ditto			....	2 more trees died Season favourable. Only 2 of the 6 new trees tapped.
1887-88 ..	46	42	'91	Ditto			....	2 more trees died. Many trees reported to have yielded no rubber.

NOTE.—The lateral spread of these trees varied between 50 and 195 feet, the average diameter of crown being 94 feet.

These results seem to point to the necessity of a short rotation only for tapping. The experience of Bengal also seems to point to this, for we can remember, from having had personally to superintend much of the work, how the heavy tapping for 4 or 5 years in 1870 to 1875 in the Darjeeling Hills resulted in the death of the larger proportion of the trees and the weakening of the survivors to such an extent that when an attempt was made six years later to tap these again it was not successful. We strongly advise further experiments: one experimental area to be tapped for two years, then allowed two years rest and trees tapped again, and so on; another to be tapped every alternate year; another every year, but only slightly, and so on. The roots should on no account be tapped for they usually give only inferior rubber and their tapping is said to be the cause of the chief injury. What is often forgotten, we think, is, that the best yielding trees are not those grown on moist lands but those on comparatively dry slopes, and herein may possibly lie the reason for the apparent unsuccess of these fine plantations. But, given a suitable area, we confess to thinking that a little crowding may not do much harm: the object is presumably to get the maximum yield from the area, and a somewhat crowded area would give more tapping surface. But we may be wrong, and it may be found that better rubber is got from branches and stems and droppers which have got full light around them, so that here, too, are questions which seem to demand further experiment.

The Question of the authority of altering Working Plans.

The following Circular was circulated a month or two ago among Conservators of Forests by the Inspector General. As it may possess considerable interest for those who have not seen it officially, we venture to reproduce it.

‘Representations have recently been made by the Conservators of two Forest Circles to the effect that the provisions of the Forest Department Code and of many existing working-plans do not permit of sufficient latitude in the execution of prescribed works, more particularly works of improvement; and it has been suggested that the present practice and the rules contained in the Code should be modified. I had previously arrived independently at the same conclusion; but, before taking further action, will be obliged by your favouring me with your professional opinion on the general question raised.

‘2. My own views may be briefly summarized as follows :—

‘(i) Exploitation in deficit might be permitted on the order of the Conservator, who should however, subsequently report results to his Local Government, and in cases where the deviation from the provision of the working-plan is considerable or continuous, obtain the sanction of the Local Government thereto. Particulars of all such deviations should invariably be recorded in the control forms.

‘(ii) The previous sanction of the Local Government should in every case be required, when it is proposed to exploit in excess (provided such excess is not caused by the accumulation of balances due to deficit exploitation in previous years), or when it is contemplated to change in any way the character of the exploitation.

‘(iii) The plan might *prescribe* that work—

(a) of silvicultural improvement, or

‘(b) connected with lines of communication and export (the execution of which in any special year may depend so largely on circumstances we are unable to control or even to foresee) should be carried out during a certain period of years. Such works might be allotted in the plan to particular years, and such allotment should be binding on the local officers unless and until the Conservator had sanctioned the total or partial postponement of the work or other deviation, reasons for which he would invariably record in Form No. 3.

‘(iv) As regards buildings, demarcation, and minor works of improvement, the general plan for a term of years might be *prescribed*, deviations from which would require the sanction of the Local Government. But the manner in which the details o

'the plan would be carried out from year to year might be solely controlled by the Conservator, who would record in Form No. 3 whether suggestions made in the plan, under this head, for each year's working, had been carried out or not, and, if not, why not.

'(v) Form No. 3 should not be made use of as an account form for the check of all expenditure upon works of improvement, but should be a record containing information sufficient to indicate how such works of material importance, prescribed or suggested in the plan, have progressed.

'3. I would ask you to acquaint me with your views as early as you conveniently can."

Inspection Notes on the Forests of South Coimbatore, North Malabar, Nilgiris and Madura.

These notes, received by the kindness of the Madras Government, are rather more instructive as samples of administration than as affording sylvicultural and other information of interest to our readers. The *South Coimbatore* note is especially remarkable for the curious circumstance that the Conservator's remarks are largely annotated by the Divisional Forest Officer who here and there is pleased graciously to agree with his Superior Officer and in other places to differ from him. After wading through these remarks, however, we were comforted at the end by finding that the Board of Revenue most properly objected to the arrangement, and expressed themselves as considering it "invidious that the District Forest Officer should appear as a direct critic of the remarks of his Superior Officer, the Conservator." One would have thought that such an obvious proposition would have been as clear to the Collector and Divisional Officer as it was to the Board. The Conservator's note is full of the minutest details in some things: even such a trivial matter as the absence of 'hat pegs' in a Range Office has not escaped his vigilant eye, but while full of such details, there is an absence of forestry information. There are, however, some interesting matters regarding Forest Engineering, and especially on the—

"*Timber Slip*.—When I was last here in 1888, I considered with Mr. Porter the feasibility of a slip in place of the drag-road down which logs were moved by elephants in the old days.

'I considered the site then selected to be too steep and further inquiries were started with view to lowering the logs by wire or other means, but nothing satisfactory was arrived at.'

'Mr. Bryant has, however, opened up a part of the old drag-road, paved it with timber laid lengthways instead of crossways,

‘and converted it into a slip, which I was so satisfied with, that I have authorized him to spend up to Rs. 500 in continuing the experiment.

‘It is proposed to slide the logs from the top slip dépôt (end of the tram line) to a bottom slip dépôt, which touches the ghât road sufficiently far down to avoid all the most difficult parts of the ghât, and thereby save As. 7-6 a candy ($12\frac{1}{2}$ cubic feet) on the present rates for carriage, which are As. 15-6 per candy by road from the top slip dépôt to the foot of the ghât.

‘The slip will be about 900 yards long, and as the upper portion already tried measures 150 yards and cost about Rs. 150, we may calculate that with more substantial work it will cost about Rs. 1-8-0 a yard, or say within Rs. 1,500 to do the whole line.

‘I think the work is feasible and my only doubt is as regards the last 100 yards or so which will be very steep, but which may, if necessary, be improved by a raised platform on trestles or a bund or by diverting the course so as to take in a hill side on the south. The saving in carriage on a take-out of 50,000 cubic feet a year would be nearly Rs. 2,000.

‘The upper portion of the slip laid by Mr. Bryant roughly averaged 15 degrees (1 in $3\frac{1}{2}$) gradient for 100 yards (the start for 20 yards was 23 degrees or 1 in $2\frac{1}{2}$), and then 9 degrees 1 (in 6) gradient for 50 yards; and one ton logs took 20 seconds to do the 150 yards, so that logs would take about 2 minutes to do the whole slip when completed—a rate of about 15 miles an hour.

‘The pace of a log will depend on the state of the slip. In wet weather logs would travel too fast. The slip will have to be sanded or greased according to weather and gradients.”

We are glad to learn that the working of the Anamalai tramway has been a success, although “the rails are too light for the work and the trucks unnecessarily heavy.”

The *North Malabar* Inspection note is annotated by the Collector and is more interesting from a true forest point of view than that of S. Coimbatore, though there is nothing much requiring special quotation.

The *Nilgiri* note we have naturally read with some interest and a great deal of disappointment. We are glad to see that the Conservator appreciates the point that ‘fires’ on grass lands ‘destroy the finer class of grasses’ and that in large grazing grounds like these of the Kundahs, the outer edges usually get much over grazed while the further portions are hardly touched. We entirely agree with the Conservator that the idea that ‘shola’ would not reproduce itself from coppice is a mistaken one. There are fine pieces of coppice regrowth in the middle of Coonoor Peak Forest and at Naduvatam, and the idea which underlies the Collector’s remarks about such work having been ‘tried and resulted disastrously,’ is, in our opinion, simply due to impatience. Those who do not understand Forests and their treatment professionally, are sometimes apt

to think that, because the show of reproduction made in the first few years is not very apparent, therefore the reproduction is a failure ; and in the Nilgiris this tendency is intensified by the ever present object lesson of the Eucalyptus. People who see the Blue gum reach six feet in height in a year are disappointed because shola-coppice scarcely reaches much more than as many inches. The whole of the Nilgiri sholas, in our opinion, very badly require treatment; and if careful treatment, under professional officers, is not given them, they will by slow degrees deteriorate and as one by one the big trees fall, their place will be occupied by bushes and scrub and *not young trees*. But we fear that until such matters are left to professionals, the sholas of the Nilgiris, like the New Forest and parts of Fontainebleau will have to continue to be treated by '*exploitabilité physique*.' Our disappointment, to which we referred at the outset, was due to the absence of any notes on the results of the blue gum and wattle working plans. There are very few Forest Districts in India which are so interesting, if properly managed, as those of the Nilgiris, but there are 'too many cooks' and if the Government does not soon insist on a simple Working Plan for the whole District, including all the Working Circles, teak, blue gum, shola, etc, and then order it to be carried out without interference, change for cavil for at least 20 years, prohibiting the Collector and Forest Officer from listening to amateur advice, there is likely to be worse deterioration than these reports shew and the forests will be converted from samples of what ought to be done, into samples of 'how not to do it.'

We have been led to some extent to these remarks by noticing that the Board are going to ask Mr. Popert to visit the Teak Forests and give his advice based on his long experience of teak in Burma, and we venture to suggest that his visit might be extended to the sholas and the plantations of blue gum. The other remarks of the Board are good and suitable, and their suggestion regarding the possible import of Mudumalai woods, other than teak, for use in the hills, is one which is fully worthy of consideration.

The *Madura* Inspection note we cannot understand. The Conservator's report says he was in the District for 23 days, but the Divisional Officer was apparently unaware of it. Here too, as in S. Coimbatore, we have explanations by the Divisional Forest Officer on the Conservator's remarks and these explanations are long: however, if the latter's inspection was not made in the presence of the former, this is hardly to be wondered at. We reproduce the remarks of :—

- (1). Conservator.
- (2). District Forest Officer.
- (3). Collector.

on the region which bears the romantic name of the 'High Wavy Mountains' as likely to interest our readers. We should

like to hear more about these hills and wish Mr. Gass would send us an account of them after his next visit.

"1. *Conservator*.—I had arranged to go across the so-called 'High Wavy Mountains with Mr. Gass, but the weather was unpropitious and the trip had to be abandoned.

'I have, however, approved of the District Forest Officer's proposal to make early application to build a rest-house up there and to secure a decent bridle-path approach to it.

'I would suggest a site for the rest-house as near the Suruli water-fall as possible. It would be higher and more central than the site suggested further north.

'With a path up, and a building erected, there would be greater chance of these fine hills being developed.

'At present little is known about them, beyond that they range between 5,000 and 6,500 feet; that the sholas there are extensive and dense; and that the only forest produce at present brought down consists of cardamom and the beesha reed.

'It is fortunate that we have been able to make them reserved rests, for they appear to catch the clouds of both north-east and south-west monsoons, and, judging from the size of the Suruli water-fall looked at from below during the rains, they must tap the clouds to a considerable extent.

'I do not know what the extent of the drainage on the top of the hills is, but it apparently all falls into the Suruli river on the Cumbum valley side of the hills."

'2. *District Forest Officer*. I have submitted detailed proposals for the construction of a rest-house on the High Wavy Mountain and for improving the present path, in the Budget Estimate and annual Plan of Operations for 1893-94.

'I do not much care where the rest-house is located. The place I suggested has a path already leading to it. The site near the water-fall is more visited by elephants. It is no doubt more central, but is at a slightly lower elevation than that suggested by me. The water here flows from north to south to the water-fall and not *vice versa*.

'A rest-house on these hills and a decent path up to them will certainly facilitate inspection and render it a more comfortable affair than it is at present. This range of hills is, however, better known than the Conservator appears to think. I have been up them frequently; always once, and sometimes twice, in the year, and I have been through them in various directions. The whole upper part is covered with evergreen forest, and not merely a series of large and dense sholas. This forest covers the top and runs down in long irregular shaped masses for a considerable distance on either side. The whole drainage from the top is into the Cumbum valley, as may be seen on the map. The Suruli river has two long branches, which, rising at some distance north and south of the water-fall, meet close to it, after flowing in almost straight lines towards it.

'The importance of these hills from a climatic point of view is very great indeed. This reserve was selected by the Forest Committee in 1880. The area of the top or plateau, if it may be so called, is probably about 15 square miles. Below the evergreen forest there is a zone of bare rocky grass land, and the lower slopes are well covered with valuable forest and are constantly visited and inspected.'

3.—'Collector.' I went to the top of the "High Wavy" with Mr. Gass and am decidedly of opinion that the forest on the plateau should be better inspected. A pathway up and a good rest-house should be made.

'The ascent is very steep, it is almost impossible to get tents up. There is too much indiscriminate cattle-grazing and shooting in all the forests of the Cumbum valley.'

IV.—REVIEWS.

A Tamil Manual of Forestry.

"A Manual of Forestry. Vols. I and II. by Dr. W. Schlich C. I. E., translated by C. M. Maduranayakam Pillai, Sub-Assistant Conservator of Forests, Central Circle, Madras. K. R. Press, Madras, 1893."

The translator has sent us a copy of this. It is a handy little Volume and is of a useful size. We are not told, however, what the price is. The translator says in his Preface, that he has had considerable difficulty in finding suitable Tamil words and phrases to give equivalents of the technical terms employed. We easily understand the difficulty and hope that those Tamil Foresters who use the work, will find the terms adopted suitable and easily to be comprehended. The translation is published with Dr. Schlich's permission and when giving that permission he advised Mr. Maduranayakam Pillai to be as clear as possible and make his descriptions as simple as possible. The print seems good though rather small and the illustrations are fairly done. We are sure the work will be useful to subordinate Forest Officers in South Madras and wish it every success.

V.-SHIKAR AND TRAVEL.

Chakla Drogmula.

(Continued from page 315 and completed.)

There is one drawback in the case of the Kandi Forests and that is the distance from the Pohru River which is a measured three miles, so that heavy logs over six feet in girth cannot be conveyed to the river at present Srinagar prices, viz., six annas per cubic foot in the log, we must therefore resort to the sawing of scantling. Hitherto the custom has been to fell only second and third class trees, because these could easily be transported overland, but this spells ruin to the forest. It might be supposed that the number of first class trees must be enormous, but this is not the case, since many have been cut to provide boat planks (*takhtas*) and many have been killed by that pest, the village mochi, who used to remove a strip of bark from all round the base of the tree, thus causing it to die. It is exasperating in the extreme to see the way land has been cleared in the very centre of the forests, first the bushes are cut, then the trees barked, so as to kill them, and finally the bushes are heaped up round the foot of the trees and fired. If any trees are felled they are left lying on the ground till dry and then burnt and this in a country where every portion of the tree is valuable and can be exported to the city at a profit. But again, are these ignorant, simple people, as blamable as our own early settlers in Australia, or as the Americans and Canadians at the present time? Do *they* look ahead to the time when timber will be scarce? Not if all accounts be true. Our aim will now be to induce the public to use blue pine instead of deodar by reducing the price; there is no good reason against the use of the blue pine in Srinagar, especially with the example of Murree to go by, which it is believed, is almost entirely built of that species. The Forest Department in Kashmir is much hampered in the delivery of timber by the fact that the Pohru River only contains sufficient water for floating logs of any size during two or three months in the year, when the snow is melting, after that it is a wretched puddle, only fit to carry small poles or scantlings. Here bullocks are used for dragging timber from the forest to the river; a loop is cut in the end of each log through which a rope is passed and some 8 or 10 bullocks are then yoked to the log. The people have an ingenious plan of turning a stream of water on to the dragging path which reduces the friction. Early in the season, when there is abundance of water in the various

small streams coming from the hills, a dam is made at a certain place below the forest, and inside this, a deep pool of water collects; to this there is a sluice gate opening into a nala which joins the river, the logs are dragged as far as the sluice, put in below, and the sluice is opened and the logs swept down to the river. This, however, is of no avail later on, and the logs have to be dragged the whole three miles by land.

A relic of the past is the system of advancing money to bring out timber, the villager considering the wood his own property till his account has been settled! I found some unmarked logs lying near the forest and on asking a question, was told they were not state property for the above reason. The result of this system of advances is, that there are now hundreds of logs scattered about in the village lands outside the forest, which have been lying there for more than four years and notwithstanding any number of orders of an urgent nature, no one has stirred to deliver them at the water's edge. The villager was paid in full, five years ago, so having nothing to get, he does not care a bit for orders and there the logs lie rotting; if the Department spends more money on them, it might whistle for it, for any chance it has of getting it back from the villagers, so that the only way will be to get some gentle pressure put on them through the Civil authorities; altogether, it is a most unsatisfactory state of affairs. In connection with this, it is curious how the present system of taking land revenue in kind, acts and re-acts throughout the land. Thus, the villagers would rather be paid in rice than in money and one of the first requests contractors make is for *shali* (paddy) and of course they want it at the rate of Rs. 1-4 per *kharwar* or 86½ seers, because it is sold to the city people at this rate. It is almost impossible to buy any rice out in the district, it would appear that those who have it are afraid to sell it at a fair rate and do not see why they should accept the State rate, so that it is most difficult to get even the small quantity required by one's servants. This Department is enabled to get a small stock by an old rule which permits it to levy contribution on each boat load of state *shali* as it passes down the river and this forms our stock, from which to supply contractors for their workmen. It will be a great thing for the country, when all land revenue is taken in cash and villagers can sell their grain at the market rate, which is higher than the State rate. Formerly cotton and other products were accepted, but some of these had to be abandoned, as it was found that the rate fixed for, say, cotton, was much higher than it was worth, consequently the sharp villager, poured in as much cotton as he could procure and the State was left with a store of stuff saleable only at a loss. It seems absurd to go on selling rice at the present rate, when it is worth much more and when everything has risen in price, and servants now get higher wages than in the Punjab to mention only one item, but, of course, the system must be gradually changed or there would be the usual outcry. Another way in which this Department is affected by the State *shali* supply, is that in order to keep

up a sufficient stock in the City last winter, the authorities had to impress all the boats they could lay hands on, consequently very few were to be had for the conveyance of firewood and timber; this is very unfortunate, as the natural result is a scarcity of both in the city and, of course, the poor F. D. is represented as being the cause of it all, because it would not allow indiscriminate fellings as before, whereas this has nothing whatever to do with it!

J. C. Mc. D.

VI-EXTRACTS, NOTES AND QUERIES

Treatment of Waste lands in the Low Countries.

The great sandy formation which covers the largest half of the Netherlands, passes out of Holland into Hanover, and stretches entirely across Northern Germany into Russia, the medium level of the whole district being only about fifty feet above the sea, and nowhere rising above three hundred. It is geologically very ancient, and its surface is marked by foreign rocks, which lie scattered over its surface, supposed to have been transported thither by icebergs from Norway and Sweden, in some previous geological epoch. This formation makes the principal part of Northern Europe one great sandy plain, with very little landscape beauty, except that which arises from great green stretches overhung with a vast and ever-changing sky, which have served as an inspiration to a race of landscape artists, who have rendered, with Dutch fidelity, the features of their country. "*Les accidents du pays*," says L'Esquirol, "*sont dans le ciel*," but these apparently meagre details have been enough for Hobbema and Ruyssdael and Cuyp to work with in producing their immortal canvases. Alternating with this sandy district, in Holland, as well as in Belgium, are extensive heath and peat lands, which afford another example of the way in which persistent industry can overcome obstacles in husbandry. These peat beds have been worked for five hundred years, so that the deposits in many cases have been entirely exhausted; but undismayed, the persistent Dutch farmers drain the holes by pumping, and put them under cultivation, the basis being clay which is

capable of being converted into a good soil. It is not uncommon to find at the bottom of these excavated basins, the remains of old forests ; but what would other people think of making farms in such cellars as these and by such tedious processes ? They begin by trenching the beds in which the peat is only fit for use after eight years, the deposit being often more than thirty feet in thickness, and only capable of removal by very slow degrees. This peat cutting, however, is a great branch of industry in Holland, for it is the only fuel the country produces, there being no coal, and but a very limited supply of forest. The growth of peat is here still in progress, and the same curious phenomena are still to be observed that were noticed by Pliny in the time of the Roman occupation. For example, fields are still found floating upon the water, and rising and falling with it. The Dutch maintain that the whole town of Dort, a large and flourishing place, shifted its location during one of the inundations. During another, a field on which ten or twelve cows were feeding, was drifted, across the Dollart, a broad sheet of water many miles in width, which forms the boundary between Holland and Hanover, and fastened itself on the opposite shore in a foreign country, without the loss of an inhabitant.

The theory which prevails in regard to these peat beds, is that they have been formed by the growth and gradual destruction of aquatic plants, growing in shallow pools and lakes, forming a vegetation which originally floated on the surface of the water and finally attached itself by its roots to the bottom, extinguishing the sheet of water by transformation. But it is in the heath lands of Holland that the greatest results have been achieved by industrious and ingenious exploitation. As late as 1842, they were considered nearly valueless, so that in that year the state sold about 60,000 acres at sixteen or seventeen cents an acre. These lands, subjugated by a regular, though varied, system of cultivation, have been so successfully handled, that twelve years after the original sale 20,000 out of the 60,000 acres were resold for nearly two dollars an acre, and since then some of them have brought as high a price as ten or fifteen dollars an acre.

The methods adopted with these waste lands are various. One is sheep feeding on such parts of the ground as admit it ; another is to shave off the sod, pile it in heaps in the sun to dry, burn it, and dress patches with the ashes or spread them on the contiguous sandy lands.

But the favourite method of reclaiming both heath and sands, is the planting of forests of Firs and Pines, which is done with the extraordinary patience that characterizes this indomitable race. Though the profit is slow in coming in, it is found to pay in the long run. The seedlings, a year old, are planted at the rate of 13,000 to 14,000 to the acre. They are first pruned in the seventh year ; afterwards every two years, the trimming

paying the expense. At the end of twenty years they are cut for hop-poles, at twenty-five years for supports for galleries in coal and other mines. In fifty years they furnish timber for small buildings, and then the land is finally cleared off and regular cultivation is begun, the soil being by that time fit for working. Poor lands, treated in this way, are estimated to yield an annual product of four or five dollars a year per acre during the process.

The ancient method of treating the heath, which was introduced into Holland some two centuries ago, was copied from the Tartars, who have practised it from time immemorial on the plains of Asia. This consists in burning the sod over vast tracts at once. At times, this is done to such an extent that the air is filled with smoke for hundreds of miles, as in the burning of our great forests. After this, the ground is merely harrowed and sown with buckwheat or other grain, of which the product is twelve or fifteen bushels to the acre. The land thus treated can be cultivated for about seven years, yielding for the first three years a good harvest. Then the crop begins to fall off and in three or four years more it dwindles to little or nothing, and the land is abandoned. After resting for twenty years it is found to be in a suitable condition to burn again. In Asia the Tartars wander backwards and forwards over the immense steppes of lower Siberia and northern China, moving to another tract when one becomes exhausted. These wandering races have been known to remote ages, and isolated bands of them drift into Europe and form a valuable proportion of the labouring population of Russia. But in the rest of Europe, and more especially in diminutive Holland, these larger features of heath cultivation are now wanting.

These pictures of struggling husbandry on sterile soils are by no means without their use. They afford an instructive lesson to the patient cultivator of stubborn and unproductive lands, who may learn from them that, however great his drawbacks, there are other people with greater ones. They teach, also, that there is no piece of soil so bad that it cannot by skill and industry be made to produce some kind of a crop which will repay its possessor for exercising his intelligence in its management.—(*Garden and Forest.*)

News for Foresters

A correspondent writes "one lives and learns! Let me commend to the notice of the *Indian Forester* a para. in the 'Indian Agriculturist' for August 12th, 1893, p. 438 on 'the evils of transplanting.' The following is the para. referred to:—

"A tree intended for timber should never be removed from the spot on which the seed germinated. No matter how carefully the removal is effected, the point of the tap roots is broken, and when that is the case the tree will never attain as great a height as it would have done if left to grow after nature's own fashion.

'It is from the system of transplanting that oaks grown in Britain acquire that round-headed habit which is their general characteristic. There may be some cases in which the direct descent of the tap-root of self-sown trees has been checked and diverted from the perpendicular by meeting with an impervious subsoil or rock. The effect in those cases would be nearly identical with that of transplanting, but as the tap-root may not have lost its point, the effect would sometimes be less plainly marked. The German high forestry system is based on the plan of imitating nature—i. e., of sowing the seeds where the trees are to stand. All the treatment given thereafter consists of thinning out the trees at intervals, and on these occasions allowing a little extra room to those that are intended to be the permanent members of the forest."

Comment on our own part would be superfluous, so we leave this gem for our reader's amusement.

Tour of the Inspector General in Assam. . .

The Inspector General of Forests intends visiting Assam in November next with the view of personally inspecting the Charduar rubber plantation, and deciding on the future policy of the Forest Department in regard to extending or putting a stop to the experiment. The plantation now covers an area of 2,063 acres and contains 28,546 established trees and plants, put out at intervals of 25 feet in lines, the latter being 100 feet apart with belts of evergreen forest between them.

VII.—TIMBER AND PRODUCE TRADE.

Statement of average selling rates of timber and bamboos in Meerut, Bulandshahr, Pilibhit, Bareilly, and Moradabad for the quarter ending 30th June, 1893.

Description.	Timber Scantlings per score.		Bamboos per 100 score.		REMARKS.
	From	To	From	To	
MEERUT.					
Sal 10' Tors (Poles) ...	R. A. P.	R. A. P.	R. A. P.		
Sal & Sain, &c., Karris, 12' x 5" x 4" ...	8 0 0	18 0 0	...	...
Sal bed posts, 7' x 2½" x 2½" ...	25 0 0	40 0 0	...	...
Bamboos of 9' to 10' per 100 score ...	10 0 0	12 0 0	...	...
	...	...	40 0 0	100 0 0	
BULANDSHAHR.					
Sal 10' Tors (Poles) ...	...	...	...	...
Sal, and Sain, &c., Karris, 12' x 5" x 4" ...	...	...	...	...
Sal bed posts, 7' x 2½" x 2½" ...	...	...	...	...
Bamboos of 9' to 10' per 100 score ...	...	...	72 0 0	72 0 0	
PILIBHIT.					
Sal 10' Tors (Poles) ...	40 0 0	70 0 0	...	...
Sal and Sain, &c. Karris 12' x 5" x 4" ...	30 0 0	40 0 0	...	...
Sal bed posts 7' x 2½" x 2½" ...	5 0 0	6 4 0	...	...
Bamboos of 9' to 10' per 100 score ...	...	...	60 0 0	100 0 0	
BAREILLY.					
Sal 10' Tors (Poles) ...	5 0 0	10 0 0	...	...
Sal & Sain, &c. , Karris, 12' x 5" x 4" ...	25 0 0	35 0 0	...	...
	40 0 0	50 0 0	...	...
	50 0 0	60 0 0	...	...
Sal bed posts 7' x 2½" x 2½" ...	10 0 0	25 0 0	...	...
Bamboos of 9' to 10' per 100 score ...	...	...	50 0 0	127 0 0	
MORADABAD.					
Sal 10' Tors (Poles) ...	20 0 0	25 0 0	...	...
Sal, & Sain, &c., Karris, 12' x 5" x 4" ...	30 0 0	50 0 0	...	...
Sal bed posts 7' x 2½" x 2½" ...	10 0 0	12 8 0	...	...
Bamboos of 9' to 10' per 100 score ...	...	...	50 0 0	100 0 0	

Churchill and Sim's Circular.

AUGUST 4th, 1893.

EAST INDIAN TEAK.—The deliveries continue good, showing 7,626 loads so far this year, against 6,421 loads and 8,978 loads for the same periods of 1892 and 1891 respectively. In July this year, 1,062 loads were delivered against 756 loads last year, and 918 loads the year before. The stock has decreased, but is still overloaded with inferior wood, which depresses quotations. The supplies are not excessive, and a little demand would soon raise prices; moreover, there seems some ground for hope that the ship building trade has passed its most stagnant point. The threatened blockade of Bangkok, which is now averted, would, if persisted in, have cut off the Siamese supply, but it was never sufficiently believed in, to give rise to any speculation.

ROSEWOOD.—The demand remains very quiet, and sales are not readily effected.

SATINWOOD.—The parcels lately arrived are sufficient for present demand, which is chiefly for figury logs, there being no demand for *planks* and *boards*.

EBONY.—Has been more enquired for, but can only be placed at low prices.

PRICE CURRENT.

Indian Teak	per load	£9-10s. to	£15
Satinwood	„ ton	£5 to	£12
Rosewood	„ „	£5 to	£9
Ebony	„ „	£5 to	£7

MARKET RATES OF PRODUCTS.

(Tropical Agriculturist, August 1st, 1893.)

Cardamoms, Malabar	per lb.	2s.	to	2s.6d.
Croton seeds	per cwt.	20s.	to	27s.6d.
Cutch	„	20s.	to	23s.
Gum Arabic, Madras	„	15s.	to	50s.
Gum Kino	„	£15	to	£20.
India Rubber, Assam	per lb.	1s.7d.	to	2s.3d.
„ Rangoon	„	* 1s.7d.	to	1s.11d.
Myrabolams, Bombay	per cwt	10s.	to	11s.3d.
„ Godavari	„	7s.6d.	to	8s.
Nux Vomica	„	8s.	to	11s.
Orchella	„	22s.	to	28s.
Redwood	per ton	£3.	to	£3-10s
Sandalwood, logs	„	£35	to	£55
„ chips	„	£9	to	£30
Sapan wood	„	£4.	to	£7.
Seeds	per cwt	40s.	to	70s.
Tamarinds	„	8s.	to	9s.

THE INDIAN FORESTER.

Vol. XIX.]

October, 1898.

[No. 10.

A tour in Jaunsar.

The Mundali Deodar Forest.—The area included in the working plan for this forest comprises 3,222 acres, of which some 2,700 are estimated to contain deodar. The lines of export lie along the ravines, or 'Gadhs' as they are locally termed, and of these there are seven, as follows :—Bamnai Gadh with an area in its basin of 488 acres, Tutua Gadh, 390 acres; Barsoti Khala, 164 acres; Girgat Gadh, 623 acres; Dugra Gadh, 762 acres; Lakhta Gadh, 338 acres; and Sarni Gadh, 457 acres. Eventually all these streams flow into the Dharagadh, down which sleepers are floated to the Tons. The bed of this stream was made suitable for floating by blasting rocks, &c., in 1889, at a cost of Rs. 3,000.

At present, only dead standing or fallen deodar trees are being exploited. The sleepers are cut in the forest, and are carried by men to Deikhera on the Dharagadh, a distance of 6 miles. They are floated from Deikhera to Chadiar, 3 miles lower down the stream, in the months of July and August, when there is sufficient water in the stream.

In October, when all danger from the sudden floods is past, the sleepers are taken down to the mouth of the Gadh, and when the sleepers from Deota arrive, are pushed into the Tons itself to join them. The sleepers are launched in the Dharagadh 5,000 at a time and are caught at Chadiar by a weir thrown across the stream.

In 1890 the weir was placed at the mouth of the Dharagadh, and all the sleepers were floated down it at one time. During a heavy flood the weir broke, and 13,000 sleepers were swept into the Tons; of these 2,200 were never recovered.

Sleepers can only be floated down the upper parts of the Dharagadh when the water is at its highest level, that is in July and August.

The cost of delivering a sleeper on the banks of the Tons is follows :—

		A. P.
Cost of sawing per sleeper	...	3 3
Carriage to Deikhera, 6 miles, each	...	3 0
Cost of floating to mouth of Dharagadh, 5 miles	...	0 6
Total	...	<u>6 9</u>

Floating is much cheaper than carriage by men ; manual labour is not available during the rains, when the carriage has to be done.

The following table shows the number of trees removed and the yield of sleepers obtained from them :—

Year.	Compartment.	Trees felled.		Outturn of sleepers.
		Half dry.	Dry.	
1888 ..	11 and 12 part of 13 and 15	100	135	M. G. 10,405
1889 ...	15 and 18 part of 14 and 20	605	373	39,124
1891 ...	...	360	248	32,853
1892 ...	...	272	292	25,525

Previous to the sleeper works, the only fellings that took place were for the supply of free grants to villagers, chiefly, in the 'khats' below Chakrata.

With regard to the conditions of growth of deodar in this forest, it has been calculated that this species attains a girth of six feet in 130 years, whereas the same girth is attained at Koti Kanásar in 80 years. After the age of 130 years, the deodar here grows very slowly ; hence there is no object in postponing the deodar fellings beyond that age.

The chief companion of deodar in Mundali is the spruce fir, the silver fir being found near the ravines and on the moister slopes.

Owing to the deodar growing up in a dense leaf canopy, the boles are clean and free from knots ; on the other hand the crowns are narrow and contracted and very few of them are in the necessary condition to bear seed ; the consequence is that we find very little reproduction : the seedlings that we do find growing under the leaf canopy and constituting the advance growth, are thin and weedy, with very little foliage and growing slowly ; they present a marked contrast to seedlings growing out in the open, under favourable conditions, as may be seen here and there at Mundali, and frequently at Mashak, Koti Kanásar, and elsewhere. The most striking point about them is their very sparse foliage, showing none of the bluish appearance found on more healthy seedlings, and with a length of annual shoot that rarely exceeds one inch. One may compare them to the suppressed deodar plants found under the thickets of blue pine.

In order to improve the growth of deodar, girdling operations have been undertaken. The object of these operations is the removal of all trees which are dominating or suppressing

deodar trees, and also to give room for the expansion of the crowns of the mature deodar trees with a view to increasing their seed producing powers. The chief species girdled is spruce fir and such broad-leaved species as are found here and there associated with the deodar are also taken. Where no deodar trees exist on the area no trees are girdled.

Certain fixed areas are taken in hand every year according to a definite scheme. The results of this girdling which began in 1883 are visible throughout in the shape of dead standing firs and oaks and it is certain that the deodar has benefitted thereby. The spruce fir takes about two years to die, and the Moru oak from 5 to 6. In the case of the latter species, it is necessary to remove every particle of the cambium layer otherwise a callus will be formed connecting the bark above and below the girdle, and the tree will continue to live. Several instances of this may be observed.

The rocks here belong to what is known as the Mundali series. They consist principally of conglomerates, in which angular pebbles of quartzite, slate or limestone are cemented together by a calcareous, silicious or slaty matrix. The series is younger than the Deoban limestone, on which it rests unconformably and it is largely developed near Kalsi. The resultant soil is a rich free loam, excellent for the growth of forest trees.

We visited Nursery No. 1 situated below and to the N. W. of the Bungalow. It is irrigated from a spring, some 600 feet distant, on the percolation system, *i. e.* water is admitted into trenches 18 inches wide between the beds, and soaks through to the roots of the plants. There were 63 beds, containing 7,145 deodar plants three years old; and 1,770 deodar and 639 blue pine, just germinated. The average height of the three year old plants was about 9 inches; they are 6 inches apart in lines 10 inches apart. They will be ready for putting out in July. The aspect of the Nursery is N. W., it is well drained, and sheltered by large trees at the sides. The soil, which is a stiff yellow loam, is improved by large additions of vegetable mould, brought from the forest.

There were also some plants in baskets. The baskets are 6½ inches diameter, and 9 inches high, and they cost Rs. 2-8-0 per 100; they are made of the common ringal.

Another nursery, No. 4, contained 872 deodar plants with an average height of 10 inches. Last year there were 3,028 with a height of 7 inches and about ⅓rds of these were put out into the forest that year. The general plan in these nurseries is only to put out the strong plants, leaving the weaker ones for another year; transplanting into nursery lines two or three times ensures bushy roots being formed, and prevents the formation of a tap root.

We also visited the various plantations. In May 1892, 185 basket plants, 2½ years old, were put out, by the Forest School students; this year the average length of the annual shoot is 8 inches which shews that they are doing well. The plants are

protected by Indigofera and other shrubs. These plants were put out in triangular patches, 5 feet from plant to plant, the whole triangle being hoed up.

In plantation No. 3 of 1892, a small area of 54 poles was hoed up, and the following plants put out:—400 ordinary transplants, 135 basketted plants, and 300 with a ball of earth. The average length of the annual shoot of the basketted plants was $7\frac{1}{2}$ in. while that of the others was $6\frac{1}{2}$ in.

Near this plantation we noticed a patch of forest stocked with spruce, moru and silver fir, the soil a rich moist loam, aspect North West. Here several trees had been girdled to give light to deodar planted underneath, and as pits had been prepared, the students, for an exercise, put out 200 deodar plants with a ball of earth 5 feet apart in triangular patches, but they will not make much growth until the girdled trees die, as they do not receive sufficient light. In 1889, Deodar and kail were sown in pits over an area of 26 acres in compartment No. 13 to the west of the bungalow. The plantation is in two places. The aspect is S-W. 10,250 pits in all were sown; the sowings failed and the pits were resown in 1890. Nearly all the pits inspected in 1891 had young seedlings in them a few months old. The soil is rich and loose and contains a good deal of humus. The plantations are in sheltered spots and the ground fairly free from the growth of harmful weeds. The seedlings are looking healthy and strong; 2,150 deodar plants were put out in this area in July and August, 1889.

In compartment No. 13 we inspected the plantation made in April of this year. The aspect is S. S. W., steep slope 35 degrees, soil hot and dry with Ban oak, Rhododendron and Aiyar scattered about; 350 basketted plants of deodar and 350 blue pine in baskets were put out alternately in contour lines, 5 feet from plant to plant, and 10 feet between the lines. The plants were 3 years old, and had been in the baskets one year.

Further on, we noticed a plantation of 1891, in which 1,380 deodar and 1,660 blue pine were put out with a ball of earth to fill up blanks. Although the aspect is S. the place is sheltered and the plants are doing well. The older deodar plants in this area had last year an annual shoot of $16\frac{1}{2}$ inches.

Planting in groups of five in 10 feet square patches, 30 feet apart has also been tried; the whole patch being well cultivated; 528 patches were thus prepared and plants put out with a ball of earth in July 1891. Under Indigofera and light shade, this kind of planting succeeds well. Last year the average height of the plants was 18 inches and of the annual shoot 11 inches.

Sowings in situ have been tried on two systems: first, the ordinary patch sowing in contour lines 10 feet apart on an open spur in compartment 10; 1,005 patches were sown with deodar in December 1890 and the seed germinated in March 1891. The soil is not deep, and the sowings have not been a success. Secondly, in plots of ground completely hoed up, 10 ft. squares. About

200 seeds were sown in each plot in December 1890, and in 1892 the average number of seedlings in each plot was 20. These large plots can only be recommended among *Indigofera*, &c. They will never answer on bare hill sides.

It will thus be seen that during the last few years, sowing and planting of deodar has been tried by a variety of methods, and the experience gained so far shews that by far the best method in the end is that of basket planting. The roots are not disturbed, and the plant can be put out in the spring whenever the weather is favourable as in 1893, so that it has the whole growing season before it. If it costs a little more in the first instance, it is probably cheaper in the long run as there are no blanks to fill up—all the plants appear to live. The next best system to this is planting with a ball of earth. It is very difficult to raise blue pine from seed except under most favourable circumstances, and, as it has to be planted as a nurse, for this species too, basket planting would appear to be most suitable.

The upper portion of the Tutua block and a portion of the Munnai block are set apart as a high level grazing ground for the sheep and goats of Jaunsar, which come to graze here in the summer when the valleys below are too hot for them. This area is too damp and high for deodar and chiefly carries a scattered crop of *Prunus Padus* *Pyrus lanata*, and maples on the gentle slopes near Kinani Pani we find magnificent specimens of spruce and silver fir. The following measurements taken with an Abney's level in 1892 will be interesting :—

Spruce fir, height	...	177 feet, girth	20 feet.
" "	...	202 " "	19 "
" "	...	215 " "	19 "
" "	...	176 " "	...
Silver fir, "	...	172 " "	18½ "
" "	...	184 " "	...
Moru Oak, "	...	151 " "	17 "
" "	...	120 " "	12 "

(To be Continued).

Located Fellings : a first step towards regular Working Plans

In their recently issued Report on Forest Administration in Madras during 1891-92, the Commissioners of Land Revenue assert that the advocacy of elaborate working-plans must be more or less a "counsel of perfection" until the immense work of forest settlement, combined with that of organizing fire protection and of training an efficient staff of subordinate officers, is completed. The value of this assertion must depend largely upon the degree of elaboration which, apart from the views of the non-technically trained heads of the presidency forest administration,

is held by competent foresters to be really necessary or desirable under present circumstances. The Local Government, however, in its orders on the Report, goes further and clears up the question somewhat. It has laid down that the preparation of plans for working the forests on scientific principles would be premature until the problems of settlement, &c., have been solved. It is needless, perhaps, stopping to consider whether these orders are equivalent to the admission that the 7,000 square miles of forest already settled may be managed on unscientific principles, until all the reserved lands and other forests, aggregating some 14,000 square miles, which it is in contemplation to settle under the Forest Act, have been legally constituted. For the moment it may be interesting to compare the views on this question held respectively by the Madras and Central Provinces administrations. In the latter provinces, conditions bearing on the preparation of Working-Plans are at least as unfavourable as in Madras. Forest settlement—which in this case means the determination as to what portions of the existing reserved areas shall be permanently retained under strict conservation, and what may be made available for cultivation, is in active progress, while there is an insufficiency of establishment under all heads—none the less the local authorities will not accept the *non-possumus* of Madras and insist on following up a middle course, such as might, indeed, have occurred to the Madras Board had it made enquiry regarding the successful substitution of the coupe for the indefinite permit system in Salem, a district of which, by the way, the forest settlement is not half-completed.

In an important Resolution, issued at the beginning of this year, in which the introduction into the Central Provinces of the system of located fellings on an immense scale has been ordered, it is said: "The Forest Department in the Central Provinces labours under a great difficulty in the want of Working Plans. Owing to the weakness of the forest staff, there is no immediate prospect of this want being supplied in the regular way. Some provisional steps of an *exceptional* character must therefore be taken, which will facilitate the collection of data preparatory to working-plans, while rendering the working of the forest something less haphazard than at present." The existing system, it is said, does not enable the agriculturist to obtain forest produce with sufficient facility and cheapness, while the issue of permits, covering all parts of the forest not wholly closed, does not admit of the forest being improved and the fellings properly supervised. The new scheme accordingly provides for the sub-division of the forest into such a number of convenient working-circles, blocks and annual coupes, as will bring the purchaser within reasonable distance of the produce he requires. Felling of green timber in each circle, whether undertaken departmentally or on the permit system, will be concentrated in the coupe of the year. The other coupes, ~~will~~ for the present at least, remain open only for grazing,

the cutting of grass and bamboos, and the extraction of dry fuel and minor products. The scheme, so far as can be judged from the general outline published, resembles that introduced some years ago into the Thana Forests of Bombay; and, in other provinces, similar expeditious methods for improving the character of the forest-growth and the system under which produce is exploited, are being brought into effect, especially when conditions for natural reproduction are satisfactory, and when the crops in each working circle are fairly uniform in character and demand little or no differentiation of treatment, the advantages of the system, as a first step towards the ultimate constitution of the crops according to various recognized sylvicultural methods, are at once apparent. It permits of far more rapid, more extensive and more material progress in forest organization than would otherwise, in most cases, be possible; it equalizes outturn and best satisfies local wants. It renders dishonest practices on the part of purchasers and of the forest staff more difficult of success. It lends itself according to the demand for produce and the means at disposal for the application of more intense treatment, to the gradual change from small beginnings to definite aims and ends, and does so without involving any material change of system. Above all, perhaps, it enables, in many instances, a relatively large proportion of the available establishment to be set free for employment in a few defined localities, and thus provides for that degree of supervision which allows of the advantages desirable from the elastic simplicity of the system being more fully reaped. Much naturally depends on the manner in which the framework of such a plan is prepared, and on the simple sylvicultural rules originally drawn up for the guidance of the executive officers. For instance, if a common felling—rotation for all the circles is decided upon, and an immense number of circles and coupes are laid out beforehand on large—scale maps without special inspection of the crops, without even calling in aid that comprehensive *coup d'œil forestier* of which the text-books speak, as is understood to have been done in some localities in India, subsequent embarrassments may prove considerable. But errors arising from the very simplicity of the system, and the main objection urged against working by area and cultural rules only, *viz.*, that the manner in which the crops are treated, in the case of improvement and selection fellings especially, cannot be controlled except after actual inspection, ought not to outweigh the advantages which, in the vast majority of the crops as they are now in this country, can be insured by the bestowal of a moderate amount of care. The coupe system, enforced in practice by means of the simple plans in question is that which seems *now* applicable to the great mass of our forests; whether the sylvicultural operations undertaken have in view the immediate creation of coppice or the improvement or restoration of crops with some ulterior object. Simple plans in such cases are preferable to those we are accustomed to in India which from their enormity of detail, can

occasionally only be applied in practice under the guidance of a specially capable officer, and are often widely departed from or abandoned after a few years trial.

The progress of forest settlement, the insufficiency of executive officers and the like, have no doubt greatly hindered advance in the organization of forest working. But it seems at least possible that what may be called the apotheosis of working-plans has had even a more deterrent effect. At the same time, there are some grounds for the idea that a working-plan in India is ordinarily intended to be an elaborate piece of work, entailing a very considerable amount of labour both before and after the application of its provisions. An administrative officer, whose business is regulated by the Indian code, may reasonably hesitate before ordering the preparation of numerous reports, each of which, as the Government of India lay down, must be drawn up *as far as possible* under 46 heads, comprising some 60 different subjects. Or he may have no particular wish to subject himself to the correspondence of "control" which, under the present orders, may arise if sanctioned plans are departed from even in particulars of no material importance whatever. In the next place, the departmental code nowhere explains that it is only as an exception, in cases, for instance where demand exceeds supply or where produce is specially valuable, that a plan need be of other than a simple kind, or that as a general rule, any considerable degree of elaboration and detail, encased within the straight-waistcoat of countless prescriptions scattered here and there in a bulky volume, is likely to defeat the object in view. On the contrary. A perusal of Code sections 83 and 86, leaves behind it the distinct impression that the short and simple plan, formulating a general scheme and leaving to the officers who are to apply it, the execution of minor details, is rather to be the exception. The Code, it is true, devotes five lines out of about eight pages to the subject of simple plans. But it does so, as it were, apologetically, apparently with a view to the provision of temporary and unsatisfactory substitutes for the more elaborate plans to be subsequently drawn up, following the procedure of the 46 headings *et cetera*. The counsel of perfection is probably first cousin to the counsel of despair. The influence of the code in this direction may be traced in the remarks of the Madras Board of Revenue and in the depreciative tone of the Central Provinces Resolution above-mentioned. Why should it be assumed that the procedure of which the outline is given in that Resolution is necessarily exceptional or irregular? These lines have been written in the desire to suggest, rather than with the endeavour in any way to prove that, in the present condition of our half-ruined and irregular forests, such simple easily understood and applicable plans need not be apologized for but are indeed those best adapted to satisfy for years to come the requirements of the people and of the Forest Department, and should rather be the rule than the exception.

‘VAGRANT.’

Wood Paving from India.

From the 'Timber Trades Journal' for July 29th the following notes on the gradual spread of the use of wood as a paving material, are worth reprinting, for they lead to a question which we may well ask ourselves in this country and that is: why should not India have its share in the supply of wood paving blocks for the streets of the cities and towns of Europe and America and probably of India itself?

'Wood Paving.—The Ipswich Paving and Lighting Committee have accepted the tender of Mr. B. G. Elliott, of Kentish Town, N. W., to supply jarrah blocks at £13 per thousand.

'At the meeting of the Camberwell Vestry, Mr. Wallace brought up a report of the surveyor's estimate of the probable cost of repairing Rye Lane, Peckham, with wood blocks. The cost of carrying out the work from High Street to Blenheim Grove was estimated at £2,000, and from High Street to Choumert Road £3,000, and from High Street to Sternhall Lane £4,000. The Committee recommended that temporary repairs be carried out at a cost of about £60. This was agreed to.

'The London County Council have agreed to pay half the cost (£4,405) of certain wood-paving works in Paddington, and to contribute £1,450 to the cost of paving the space between Sussex Place and Chester Place with wood.

'The Finance Committee of the London County Council admits that there is good ground to assume that jarrah wood will last longer than deal, and hence the Council allows seven years for repayment of loans on its account. But on Tuesday it declined to advise the Council to extend the period beyond that time. Consequently they have only consented to the St. Pancras Vestry borrowing £24,000 for jarrah or karri wood paving, on condition that it be repaid in seven years.

'The Strand District Board has received permission to borrow £7,000 for wood and asphalt paving works.

'The London County Council is about to pave the Whitehall Place approach to the Victoria Embankment, in equal portions, with jarrah and karri wood respectively, at a cost of £3,100, in order to test the two kinds of wood. The work will be carried out by the Works and Stores department.

'The Woolwich Local Board of Health on Tuesday accepted the tender of Messrs Mowlem & Co. to lay jarrah wood paving in the vicinity of places of worship."

The noticeable point is the great use which is beginning to be made of the two great West Australian timbers 'jarrah' and 'karri' and the flaring advertisement of companies to work concessions of forests of those species are not uncommon in the newspapers. But surely we have in India timber just as good and procurable from forests situated on good rivers within easy distance of the coast which could compete in every respect with the Australian trade. If

the Ipswich rate is anything like an average, it comes to about 8d. per block, and if each block is 4 in. square and 6 in. deep, to 4s.-8d. cubic foot.

It seems probable from the indications we publish and from other information, that most European and American towns will sooner or later replace their old stone, asphalt or macadam pavement with wood. Since it has been proved that, by the American method of hot air drying, all fungus germs can be killed and all albuminoid substances so desiccated as to obviate development on them of fungoid growths without interfering with the physical qualities of the timber, many of the objections to wood-pavements have been removed and especially those connected with sanitation. Consequently, the gradual introduction of wood in road-paving is merely a question of time, and those who are interested in finding markets for surplus forest produce ought not to pass the opportunity of sharing in the demand which it may safely be anticipated will shortly spring up.

It seems that hard heavy woods like 'jarrah' are likely to be preferred to the softer deals and pine which have been used so much in London; and it is just these heavy woods of which we possess in some of the Indian forests, such a large quantity which at present has little or no sale. It has always been more or less a reproach against the Indian Forest Department that railways have been made through its reserves and these reserves have not assisted in the supply of sleepers. The causes of this are easy enough to understand, and are (1) the preference which the companies shew for iron sleepers which can be provided merely on an order to a large firm and with comparatively little trouble in examination; (2) the desire of forest officers to make a good show of revenue and perhaps to stand out for too large a profit; (3) the want of labour and the difficulty of organization in new localities, often unhealthy; (4) the imperious necessities of Budget arrangements which prevent on the one side, the Public Works Department or the Railway Company from giving its order sufficiently long before hand; and on the other, the forest officers from getting ready sleepers when it is not absolutely certain that they will be purchased; (5) the small size of Indian trees except in the hills, preventing the economic use of any but the best and soundest and straightest of timber for such a purpose as sleepers, and so on; but in the case of wood-blocks these difficulties would disappear: for if the market is large, blocks can be cut for it without previously arranged contract for sale; a small profit will be better than none at all; the small size of the pieces makes extraction and conversion easy, and any trees having sufficient heart-wood for the purpose and otherwise sound will do. So that we think there is a great future for the industry and that it behoves those who are in charge of forests which have suitable timber, not to lose the chance which is now presented to them.

First and foremost among the likely woods, is undoubtedly the 'Pynkado' (*Xylia dolabriformis*) which occurs throughout Burma

and also in large quantities on the opposite coast in the hills of Visagapatam and Godavari, all within easy reach of the sea and usually provided with cheap water carriage. Pynkado is already in use for telegraph poles and sleepers and we imagine that the new paving-block industry would prove economical as enabling less of the wood to be wasted, for many trees which might only give a few sound sleepers could also give in addition a fair number of paving blocks out of ends and sides and pieces with knots and similar flaws. We would suggest that an attempt be made by the Burma Forest Department to send home to some good agent for sale, a large consignment of 'Pynkado' and have it tried. Perhaps the well-known oil which fills the pores of the wood may make the preliminary use of a desiccation process unnecessary.

Then there are also many other kinds which might do, for instance, the ubiquitous *Terminalia tomentosa* the 'Saj,' 'Asan,' 'Toukkyan,' 'Maddi' of various parts of India seems just the kind of wood for the purpose. Then there is the 'Nagesar' or 'Gangaw' (*Mesua ferrea*) of which considerable quantities could be cut and brought to Chittagong, Akyab and the Burmah ports without much expense. Then there are the *Lagerströmias*, *Shoreas*, *Hopeas*, *Hardwickia*, *Soyimida*, and doubtless many other names will occur to those who are in charge of forests in likely places such as the West Coast country from Bombay to Cochin, the East coast forests from the Kistna to the Muhanadi, the Chittagong Hills, the Sunderbuns, and the forests of Aracan, Pegu and Tenasserim—everywhere in short where a copious rainfall gives forests of large trees and a large supply of timbers of many species only a few of which have, like the Teak, an assured and permanent market.

It must be remembered by those who try for the new market that success is not always attainable at once. Every tradesman who starts a new business in a new commodity, knows that it takes a good deal of capital, some time, much advertising and above all plenty of patience to start a market, but that when once successfully gained, the returns flow in. It is no use giving up because a "small trial consignment" fails, the thing to do is to go on, to force the market and it will succeed in the end. We feel sure that if really strong measures are taken to obtain it, India will, before long, send to Europe and America paving blocks to the value of many lacs and the forest revenue bid fair by its increase to repair some of the losses which may result from the present financial crisis and by the attempts which are being made to reduce, if not abolish, the revenue from opium. A few years' time should see 'Pynkado' and other names as much household words in the European and American paving block market as are the 'Jarrah' and 'Karri' which our Australian neighbours have taken such pains to introduce and sell.

As a proof of what can be done in this respect, we need only point to the trade in Padouk which has been firmly established within the last few years.

The Prize day at Coopers Hill, 1893.

The Prize day was held on the 28th July, and in the unavoidable absence of Lord Kimberley, the prizes won during the season, at the Royal Engineering College, Coopers Hill, were presented by Sir Alfred Lyall.

General Sir Alexander Taylor, in reviewing the events of the past year, mentioned that in the case of the foresters the extension of their course of training from 2½ to 3 years, sanctioned in 1891, had now taken effect, and he had no doubt the new arrangement would be attended with good results. It was to this department that it was due that the forests in India which were rapidly disappearing under the wasteful arrangements that formerly prevailed, are now being fostered and conserved, without stopping the supply of timber to the market. At the same time, an important income was being secured by the sale of forest produce—an income that was rapidly increasing. The official returns showed that in 1891-92 the net income of the Department after deducting all charges, amounted to Rs. 64,66,580. These results were due to the administrative ability and high professional skill of the superior officers of the Department. It was quite certain, however, that if Forestry was to go on advancing in India, the training of Forest Officers must keep pace with the times. How was this to be done? The home of economic Forestry was the continent of Europe, especially France and Germany. It had therefore, been the custom to devote the latter part of the Forestry course to a visit of three months to the most suitable forests of Germany. These annual visits had now developed into a system of apprenticeship, extending over 5 months, beginning in April and ending in the middle of September, and this year the foresters had been apprenticed two by two to Prussian forest officers. This arrangement was at present in an experimental stage, and time only could show whether all the advantages expected from it would be realised. It was hoped that on the completion of his apprenticeship next September, the young forest officer would be equipped to go to India with such a grasp of the subject, both theoretical and practical, as to be competent to introduce the best methods of European forestry, so far as they could be adapted to the conditions of the East. Another change connected with the Forestry branch deserved notice. Hitherto the fellows of the college had been appointed exclusively from among the engineering students, but Lord Kimberley had now decided that foresters should also be eligible, and this decision had been given retrospective effect to. Five foresters who had passed out in days gone by, *viz* :—Rogers, B. B. Osmaston, Haines, Leete and Carr had consequently been appointed fellows by the Secretary of State and two foresters were included in the fellows appointed this year. The fellowship of the college was the highest honour that could be conferred on

a distinguished student. It was not granted to a fixed number at the head of the senior year, but only to a selected few who had done so remarkably well as to call from the college and the Secretary of State a special mark of approbation. In regard to the senior foresters just about to leave, Dr. Schlich wrote that taking them one with another, they were the best set of forest students that had been at the college.

The following information so far as concerns forest students is extracted from the year's prize list.

Appointed fellows of Coopers Hill.

H. G. Billson. ... C. C. Abbey.

Scholarships—Second year Students.

Scholar in the forest course B. O. Coventry.

Prizemen—Third year Students.

Forestry ... C. C. Abbey.

Forest law ... R. M. Williamson.

Accounts (open to the whole college) H. A. Latham.

Prizemen—Second year Students.

Forest management ... H. E. Bartlett.

Botany ... B. O. Coventry.

Geology (open to the whole college) B. O. Coventry.

Prizemen—First year Students.

Botany ... W. W. Mayes.

Sylviculture ... W. W. Mayes.

Sir Alfred Lyall, in distributing the prizes, said he was particularly gratified to hear that engineers and foresters of the third year were exceedingly good. No one connected with India could fail to understand the great reliance placed on men coming from Coopers Hill to fill positions in those important branches of the Indian Government, namely, the Telegraph Department, the Forest Department and the Department of Public Works.

The following students have been appointed Assistant Conservators of Forests, H. G. Billson, C. C. Abbey, R. M. Williamson, R. C. Milward, F. Linnell, W. F. Perrée, C. B. Smales, S. Cox, E. P. Stebbing, H. F. A. Wood, H. Tireman, F. E. B. Lloyd.

C. G. R.

Obituary, J. Kelly.

We regret having to announce the death of Mr. J. Kelly, an Extra Assistant Conservator on the Provincial staff of the Assam Forest Department. Mr. Kelly was transferred from the Revenue Survey Department in 1886 and joined the forests as a Sub-Assistant Conservator. He was promoted to E. A. C. 2nd grade on the reorganization of the Department in 1891, and to E. A. C. 1st grade in April 1893, only a few days

before his death, which occurred on the 28th May in the General Hospital, Calcutta. Mr. Kelly had been in charge of the Nowgong Forest Division during the past two years and had proved himself a useful and successful officer in that appointment. He was much liked sociably, for many generous qualities, and his early death at the age of 35 has been regretted even beyond the circle of his departmental friends. He was a conspicuous and enthusiastic trooper of the Assam Volunteer Mounted Infantry and a very regular attendant at the yearly camps of Exercise of this Corps, from which his genial presence will be much missed on all future occasions.

II.—CORRESPONDENCE.

Tea-Boxes.

SIR,

I see two notes in the Indian Forester for June 1893, on the subject of tea-box woods, one by Mr. C. W. Hope and the other by the Honorary Editor.

I should like to make a few remarks on the subject, as I think that I had a good deal to do with the tea-box trade making such progress in the two districts of Lakhimpur and Sibsagar in Assam.

Before the year 1886, few tea-boxes were cut up in Assam and Government made little or no revenue from this trade.

Mr. J. Hulbert who was manager of the Upper Assam Tea Company was the first to start the trade on a proper footing, with an energetic manager and first rate machinery. It was through him that I was induced to send forward proposals, regarding the levying of Government royalty on a new basis; and this it was that gave the great impetus to trade of late years, as can be seen from the figures given in the Assam Forest Report for the year 1891-92. These rules avoided all the friction that formerly occurred with the Forest Department: and nearly all the sawmills applied to be allowed to work under them.

The out-turn of tea-boxes (see figures in the Assam Forest Report) is now nearly 4,00,000. Mr. C. W. Hope thinks these figures are over estimated by nearly one lakh; but he must remember, that in this total are included boxes, cut up from private timber, that do not therefore pay the Government royalty one anna a box.

Again it is stated that Messrs. Davenport & Co. of Calcutta, import annually 1,500,000, of Japan Tea-boxes. Are these figures correct?

I am sorry I have not got the figures to which I can refer; but still I think I can remember sufficient to shew there must be something wrong somewhere.

The out-turn of tea for the whole of India, is, I believe, something under 130,000,000 lbs ; and an ordinary tea-box holds at least 90 to 100 lbs of tea on the average ; so that Messrs. Davenport & Co. import annually more than a sufficient number of tea-boxes from Japan, to pack the whole of the tea production of India. In this case what becomes of all the boxes made locally ?

The 400,000 tea boxes shewn in the Assam Forest Report for 1891-92, are, I believe, only the out-turn of two or three districts in Assam, and I fancy that for the whole of Assam at least 600,000 boxes are made locally, or purchased otherwise than through Messrs. Davenport & Co. These 600,000 tea-boxes being sufficient to hold nearly half the tea produced in India : can you therefore tell me, how Messrs Davenport & Co. manage to dispose of their 1,500,000 Japan tea-boxes.

I could give a good deal more information on this subject, both as regards sawmills, the Assam rules for sawing tea-boxes, the woods used, &c., &c., if Mr. C. W. Hope would care to have it ; in the meanwhile I will wait to hear further from him.

VIPER.

NOTE — Possibly the mistake has arisen by "tea boxes" being mixed up with "tea shocks." 1,500,000 tea shocks would represent a very much smaller number of tea-boxes, probably not more than 135,000.

Growth of Eucalyptus in Hoshiarpur.

DEAR SIR.

The following statistics as to the growth of Eucalyptus in Unah, Hoshiarpur district, will probably be of interest to some of your readers.

The trees were raised from seed, obtained from Abbottabad, and sown in, I think, 1877 or 1878 (certainly not earlier than 1876) and some of the finest now measure as follows :—

1	Girth 4 feet from the ground	5 ft. 7 inches,	height	115 ft.
2	do.	5 "	" "	115 "
3	do.	5 "	1 "	115 "
4	do.	5 "	6 "	75 "

The species is *E. tereticornis*.

I give also the measurements of 4 years back which show I think a good rate of growth in a tree, more or less mature. The measurements for 1889, presumably for the same trees, are as follows :—

58	inches at 4 feet from the ground.
56	do.
54	do.
54	do.

W. COLDSTREAM.

III.—OFFICIAL PAPERS & INTELLIGENCE.

Allowances to Working Plans Officers.

The following circular on this subject has recently issued and may be of interest to some of our readers.

The Government of Bengal has drawn attention to the application in practice of the provisions of sections 21 and 23 of the Forest Department Code, under which a specially appointed working-plans officer is entitled to draw a local allowance, and has suggested that the rule should be materially modified or cancelled. The reasons adduced in support of this suggestion are, mainly, that the allowance is generally unnecessary and inexpedient, because the officer concerned may receive special remuneration for several months during which he does but little towards the actual preparation of the plan ; because his responsibilities will ordinarily be less heavy and his duties less arduous than those of a divisional forest officer ; because he is not necessarily specially qualified ; and lastly, because the grant of the allowance is a direct incentive to postpone as long as possible the completion of the working-plan.

2. The Government of India are disposed to think that some alteration of the existing rule is desirable ; but, before issuing instructions, they will be glad to learn other views on the questions raised. I am to suggest for consideration that, in the event of special remuneration being considered advisable at all, the grant of the allowance should be contingent on the support of the Conservator of the circle concerned, who would be required to show that exceptionally arduous work, increased personal expenditure, or prolonged travelling in remote or difficult localities, is entailed in each case. It may also be remembered that the divisional forest officer is in many cases the official best qualified to prepare a working-plan for the forests of his charge ; and it will often be the most convenient course to entrust the work to him, making special arrangements to relieve him of some of his current duties. In such a case, the divisional officer would be called upon to undertake such business as a part of his ordinary duties, and it would require some very special circumstance to entitle him to a special reward.

Budget Estimates of the Forest Department for 1893-94.

The Budget Estimates for 1892-93 were given at page 390 of our last Volume. We now give the figures of the Estimates for 1893-94, the current year.

PROVINCES	1891-92.				1892-93.				BUDGET ESTIMATES, 1893-94.			
	ACTUALS.				REVISED ESTIMATES.				FINALLY SANCTIONED BY GOVERNMENT OF INDIA.			
	Receipts.		Charges.		Receipts.		Charges.		Receipts.		Charges.	
	Ra.	Ra.	Ra.	Ra.	Ra.	Ra.	Ra.	Ra.	Ra.	Ra.	Ra.	Ra.
INDIA.												
General Direction	..	53,668	..	53,668	..	5,500	74,705	..	..	69,000	..	69,000
Indore	..	6,488	..	5,938	..	1,800	1,380	..	4,530	1,500	..	1,500
Imperial Forest School	..	1,788	..	44,347	..	1,800	61,000	..	1,500	62,000	..	62,000
Survey	..	257	..	26,625	..	463	22,000	..	1,500	28,000	..	28,000
Almora	..	19,799	..	5,813	..	14,000	14,000	..	14,000	14,000	..	14,000
Andamans	..	2,73,338	..	92,430	..	3,80,237	2,83,000	..	3,80,000	2,04,000	..	1,25,000
Bachchan	..	1,79,908	..	92,430	..	3,80,237	2,83,000	..	3,80,000	2,04,000	..	1,25,000
Coorg	..	1,82,689	..	90,487	..	1,82,689	91,000	..	1,82,689	90,500	..	92,000
Ad or deduct for rounding	..	1,82,897	..	90,638	..	1,82,897	91,000	..	1,82,897	90,500	..	92,000

TOTAL INDIA	..	5,04,376	..	66,769	..	6,00,000	5,24,000	..	5,34,000	5,57,000	..	5,57,000
Central Provinces	..	13,32,906	..	8,03,132	..	12,87,000	8,73,000	..	14,00,000	10,00,000	..	10,00,000
Upper Burma	..	13,57,300	..	3,43,253	..	20,75,000	4,45,000	..	16,30,000	6,83,000	..	6,83,000
Lower Burma	..	28,68,114	..	13,24,965	..	35,30,000	13,73,000	..	30,00,000	14,00,000	..	14,00,000
Assam	..	8,36,129	..	2,67,135	..	8,43,000	2,83,000	..	8,74,000	3,14,000	..	3,14,000
Bengal	..	7,89,653	..	4,87,470	..	7,50,000	4,45,000	..	7,74,000	4,81,000	..	4,81,000
North-Western Provinces and Oudh.	..	17,31,614	..	9,52,241	..	17,75,000	9,74,000	..	16,46,000	10,62,000	..	10,62,000
Punjab	..	10,30,674	..	6,89,357	..	8,12,000	6,70,000	..	9,00,000	6,74,000	..	6,74,000
Madras	..	16,94,316	..	3,80,941	..	17,64,000	13,90,000	..	19,06,000	16,24,000	..	16,24,000
Bombay	..	52,84,649	..	19,27,138	..	53,50,000	19,50,000	..	55,10,000	22,52,000	..	22,52,000
TOTAL	..	1,49,06,825	..	84,23,613	..	1,62,76,000	89,29,000	..	1,53,88,000	96,67,000	..	96,67,000
Exchange on charges in England.	7,420	..	..	17,000	..	..	9,000	..	9,000
	3,220	..	..	10,000	..	..	6,000	..	6,000
TOTAL	..	149,06,825	..	84,30,253	..	1,62,76,000	89,56,000	..	1,53,88,000	99,02,000	..	99,02,000
Berar	..	6,11,165	..	1,98,306	..	4,88,000	2,40,000	..	4,90,000	2,61,000	..	2,61,000
GRAND TOTAL	..	154,17,010	..	86,87,619	..	167,64,000	91,96,000	..	163,78,000	101,53,000	..	101,53,000

IV.—REVIEWS.

Forest Planting in New York State.

Forestry in the United States has up to date, at any rate from a Government point of view, been a failure, and a failure as regards the whole country it is likely to remain for many years to come. But though it is not likely that Congress will take the matter up and pass general laws to constitute a Government united forest domain, to prevent forest firing, regulate lumbering, and arrange for the restocking of areas too denuded for natural reproduction; yet there are many signs that individual States are taking the matter up, and that, although not quite in the same way as is done in the chief European countries, in India, and in some British Colonies, a considerable step towards forest maintenance will soon be apparent. Among the pioneer States in the forest work, the foremost will probably be that of New York, the great State which stretches northwards from the great American seaport to the Canadian frontier and furnishes in the Catskill and Adirondack mountains some of the most beautiful localities of Trans-atlantic scenery. Dr. Jarchow's little book, which is now before us, is expressly published in order to act as a sort of Forestry text-book for the New York State and though no doubt here and there there will be found some useful advice and valuable information, yet on the whole the result cannot be said to be wholly satisfactory. Compared with such a really useful practical work as Dr. Franklin Hough's 'Elements of Forestry' in some respects Dr. Jarchow's work is only disappointing. The work is divided into three parts, 'Forest culture,' 'Forest planting on plains' and 'Forest planting on mountains.' In the first, after several general chapters of an introductory kind, ten pages are given to 'Systems of forest Management' and four to 'Natural reproduction' the rest being devoted to Artificial Reproduction of a more or less horticultural character.

'Scientific Forestry' 'our author tells us' 'does not designate any exact science' but consists in three points which are (1) sustained production, (2) natural regeneration, (3) progressive improvement: and here we have no doubt but that the author has very rightly consulted our old Nancy text book by M. M. Lorentz and Paradé. We can only feel sorry that he did not consult it further.

'FOREST PLANTING' a treatise on the care of timber lands, by H. K. Jarchow, L. L. D., Orange Judd Company, New York and Kegan Paul, Trench, Trübner & Co., London.

Properly preserved forests, he tells us, must : (1) be guarded from encroachment ; (2) be protected from injury of various kinds (3) be managed by three principles, *first* "the annual felling of 'mature, or defective dead trees and their transportation so that no 'damage shall be done to young growing trees ;" *secondly* "the 'periodical thinning out of places where the trees have sprung up 'too thickly ;" and *thirdly* the filling of vacant spots "by natural 'reproduction of the trees either by shoots, sprouts or layers, or by 'the natural sowing of seed" or "by artificial replanting." So far, so good, this is excellent as a beginning but the programme is not always properly developed.

Dr. Jarchow claims that the State should own ; (1) the forests and areas surrounding the watersheds of the navigable rivers ; (2) the sand-dunes along the coast ; and (3) every area unfit for agriculture but adapted for forest ; but his illustrations of the advantage of state management are not always happy as may be seen from the following extract

'For instance, if a private person possesses a mine which cost 'every year \$100,000 in order to obtain its yearly output valued at '\$100,000, there is no net profit, and the owner of the mine would 'hardly be inclined to continue the enterprise, unless prompted by 'the charitable desire to give some men employment. From a 'quite different standpoint would in this case the question of the 'profitableness be considered, should the Government take this work 'in hand. The \$ 100,000 paid for labor, machinery, etc., would 'then be looked upon as benefitting the people, and the nation 'would have by the continued exploitation of the mine a profit 'of \$ 100,000 every year, that being the sum which had been dis-tributed for labor, etc.

In the 5th chapter the advantage of Forest Schools is described and the School he takes for his model is not one of the well-known German institutions, or that at Nancy, but the comparatively minor French one of 'Les Barres' where some half-dozen subordinates are yearly instructed in practical work.

We do not propose to attempt to discuss in detail Dr. Jarchow's hints on the artificial rearing of trees for we know too little of the requirements of the individual American kinds. We prefer to let our readers judge for themselves, and say, that while wishing every possible success to New York Forestry, we hope the next writer will produce a work of a more suitable kind, and treat his subject from a wider point of view

Annual Forest Administration Reports for 1891-92 for the Central Provinces and Bombay.

With the exception of these two Reports we have now gone over all the Provincial Reports for 1891-92. In some respects the two most interesting have been kept till the end, for in both of these Provinces the Local Government has found fault with its officers, without there being, that we can find out, sufficient reason for doing so.

Thus, in the *Central Provinces* Report, the most noticeable matter is the censure bestowed by the Chief Commissioner on the Forest Staff because most of the offences in which Section 67 of the Forest Act was put in force were apparently 'utterly trivial.' We should like to know what the Chief Commissioner thinks section 67 was inserted in the Act for if it were not to meet the case of 'utterly trivial' offences i.e., offences in which it would not only be hard on the offender, but would entail too much loss of time on the forest officer, if the accused were taken before a magistrate. In most Provinces, there would probably be censure if in the Annual Reports the offences compounded were not found to be trivial, and the silence on the subject on the part of the Government of India Resolution seems to point to what we feel sure is the case, their disagreement with the point of view from which Sir Antony MacDonnell regards Section 67. No doubt 7,849 is a large number of cases, but the Province is a big one as regards wideness of forest area and the protective staff is admittedly weak and possibly does not always remember that preventing offences is better than detecting them after commission. To make a practice of letting off offenders in 'trivial cases' would simply make the Department a laughing stock; to prosecute each before the Magistrate would be very often hard on the men concerned and would keep the Forest Officers hanging about courts half their time, so that we are at a loss to see what the Chief Commissioner would have the Forest Officers do. If he wanted to introduce leniency in such matters, a quiet hint to the Conservators would have done all that was wanted, but to publicly censure officers of the Government for doing their duty and carrying out the law is hardly calculated to bring credit to the administration of India. And it is the same with the order about cattle in transit who are now "only to be impounded when the injury done to the forest is serious and deliberate." To prove serious and deliberate injury in such a case would be almost impossible, for the injury is not usually due to the passage of one herd but to the continued and successive passage of many herds; and besides, there would usually be but little evidence of intentional damage and consequently the order means, so far as we can see, that cattle are in future to come and go through the forest as they please, along or on the sides of public roads and within 50 yards on either side, and it would have been better to have said so at once straight off.

Col. Doveton utters a warning note as to the danger of reducing too much the area of true forest in the Central Provinces. He says, with reference to the Agricultural Department Resolution of 1891 on the classification of the Forest area.

"The fact has to be faced that it is only in the true forest area that fodder and water are likely to be found in times of real scarcity. Scrub jungles will answer well enough in time of plenty, in the rains and in the cold season; but in times of real scarcity they must in these Provinces prove a broken reed. Then it may be noted that, with a few exceptions, in these Provinces there is not likely to be any true forest of any extent that has got grass lands in patches within it."

We presume his intention is to deprecate too wholesale an action on the recent determination of Government to disforest portions of the Reserves for extension of cultivation. In the Northern Circle, under the recommendation of a previous Conservator (now retired) considerable areas have already been cut off and alienated and we hope that before they go much further with this policy they will not forget Col. Doveton's warning and remember that the Government of India themselves only approve of the arrangements "provided that the culturable area is in each instance of sufficient extent for the formation of a village and that the reserves are not unnecessarily cut up or honeycombed by scattered cultivation." It would be strange if, while we are all reading Dr. Voelcker's excellent report recommending the extension of the forest area in the interests of agriculture, we should be in some places reducing the existing area to a less amount than the country ought to have.

The difference between the methods of shifting cultivation adopted by the Gonds and Bygas respectively forms one of the subjects of the greatest interest in the Report of the Northern Circle. Mr. Thompson says:

"In Mandla extensive open valleys exist containing rich black soils, which have resulted from the decomposition of the prevalent surface trap rocks. These valleys occupy an aggregate area roughly estimated to be a thousand square miles. There is little or no forest growth on the land, the forests only occupying the sides, crests and flat tops of the aligning ridges. At present the valleys are well watered, thanks to the prevailing cover along the confining ridges, but a time may very shortly come, unless specially provided against, when the present forest growth on the upper ridges and plateaux shall have been swept away by the axe of the rapidly advancing Gond cultivator, who, weaned by advancing competition of his habit of Dhya cutting, has fallen almost unobserved into the far more destructive and pernicious habit of making *burra* clearings, that is clearing the land gradually—for a temporary form of cultivation—of its timber growth. First, as preliminary to further operations, the brush-wood is caused to disappear, the land being immediately ploughed or

'raked up and sown with kudo and kutki ; in a year or two
'or later follows the disappearance of the trees, and then a plain
'or open hill side is created, which is thus exposed to the
'fullest action of the prevailing frosts of those uplands.

'Following the denudation of the land by removal of its
'timber covering, the usual annual growth of grass and of
'young shoots from the remaining living stools left in the
'ground, appear ; the cold season sets in ; frosts make their
'appearance ; and by the middle of the ensuing spring season
'the plains and hill sides are cleared of every vestige and stick
'of vegetable growth by the annually recurring fires. This,
'repeated in time without apparent cessation, gives the key to the
'evolution of the great plain-valleys and the treeless hill sides
'of the central, northern and north-eastern portions of the Mandla
'District.

'The extent to which absolute results have thus been brought
'about by the Gond, sinks into insignificance the more immediately
'patent and therefore striking clearings made by the Byga with his
'bewar cuttings. And with this important difference that, while the
'Byga lays bare a hill side or cuts down the trees on the crests of
'ridges, no sooner has he done with the land than it again becomes
're clothed with wood of some kind or other, because his work lies
'in a region which is above the influence of frosts. Not so as re-
'gards the clearings made by the Gond. The latter has left his
'mark on the country in a manner that will take centuries to ob-
'literate ; while in thirty years the mischief done by a Byga is more
'or less repaired. Thus is the difference marked between the re-
'sults the Byga creates in a forest, and that which the Gond to
'the present day, in some of the districts of the Central Provinces,
'is encouraged to do in the hope that he is the pioneer to more
'settled forms of cultivation. While every possible measure has
'been taken to restrict the Byga's tendencies and to confine him to
'localities wherein he cannot do much present harm, the insidious
'Gond is still left to roam in almost full possession of hill sides and
'valleys, under the belief that he is practising a harmless if not a
'permanent form of cultivation."

The Local Government seems to have disapproved somewhat
of these remarks, for they say :

'The Chief Commissioner has noticed Mr. Thompson's remarks
'on the excision of land for cultivation in Mandla, and on the
'injury done to the forests by the *barra* and *bewar* clearings for cul-
'tivation of Gonds and Bygas. It is notorious that Gonds and
'Bygas in past times have done much damage by their wasteful
'methods of cultivation ; but the Conservator, Northern Circle, is
'evidently imperfectly informed on the facts, when he says that
'Gonds are now-a-days allowed "to roam in almost full possession
'of hill sides and valleys under the belief that they are practising a
'harmless, if not permanent, form of cultivation " and that "in
'some of the the districts of the Central Provinces they are *encour-*
'*aged* (in wasteful clearings) in the hope that they are the pioneers

‘of a more settled form of cultivation.’ The policy of the Administration is directed towards the abolition of *barra* and *bewar* cultivation; and the suppression of the migratory habits of these aboriginal tribes is the direct object of that system of patch cultivation which, though the result of *barra* clearings in the past, is now made to lead up to a ryotwari settlement. But the ingrained habits and customs of centuries are not changed in a day: nor can the lives of a very helpless and very pitiable class of the population of these Provinces be wholly subordinated to departmental views. Efforts compatible with the safety of these poor aborigines are being made not merely to wean, but to force them from a migratory to a settled system of agriculture; and so far as the Hygas are concerned, a successful issue is well within sight. The very essence of the ryotwari settlement is that the cultivator binds himself to pay the revenue fixed on a survey number, and he cannot take up any new land without payment for a fresh survey number. Moreover all culturable areas are demarcated into survey numbers within the limits of some particular village constituted under the excision scheme, and it is not open to the ryot to pick and choose the site he likes. It will no doubt take time and tact and management to convert all restless Gonds into settled cultivators, but the work is in hand.”

And the Government of India endeavours, diplomatically, to show that there is much to be said on both sides in the following order.

“The Government of India have read with interest and concern paragraphs 13 and 14 of the Report of the Northern Circle, which, though indicating an incomplete appreciation of the policy of the administration towards the Gond cultivators, seem nevertheless to give a correct picture of the destruction which is still being worked by them; and they agree with you that the object to be held in view is the conversion of the Gond into a settled cultivator at the same time that *barra* cultivation is suppressed. Future administration reports should indicate the results and progress of the efforts made in this direction, and should specially notice in what particulars and to what extent the system of patch cultivation mentioned in your Resolution differs in practice from *barra* cultivation, and whether the changes made have had the desired effect.”

In the Northern Circle *strip fellings* were carried on in the Sukri Forests. We were under the impression that these strip fellings had everywhere been given up as too costly and troublesome and as having practically failed. Some of our readers may be interested to hear that for each stack of firewood measuring 25ft. x 5ft. x 4 ft. = 500 cubic feet, Rs. 5 was paid to the contractor, and that each such stack was found to contain exactly 100 maunds of fuel.

The death of sal trees in the forests of the Banjar Valley both in 1869-70, and again in 1891-92 is described in the following note which we extract as being one of much interest. If we remember rightly, something similar has occurred in very dry years in the Sal forests of Bengal, in the Darjeeling Terai and the Western Dúars

'The years 1869-70 were years of drought and famine over large tracts of India. Those years were specially remarkable for the large number of trees which died in the Sal forests of the Banjar Valley. The past two years have again been exceptional as regards little rainfall, with the result that again a large area of Sal forest on the lighter soils is disastrously affected by the prevailing drought. As a striking case in point that the cause of death of the trees is due to drought, may be cited (1) the vigorous and healthy growth of the species resting on the more humid soils which are made up principally of matter derived from the prevailing trap-rocks,—and (2) the remarkable healthiness of the forests, though individually not attaining the stature of trees on the lighter soils of the metamorphic region, of the Sal forests resting directly on the traps in the north-eastern parts of Mandla. In this region, for miles round, the Sal occupies the pure trap, attaining larger dimensions as the higher laterites are reached. Nowhere in the trap forests was it observed that the trees were dead or dying. Hence there can scarcely be a doubt that the cause of so many Sal trees dying in the Banjar Valley Reserve is due to the drying up of the soil in years of little rainfall, to an extent injurious to the living tree. We have also the coincident fact that a similar phenomenon appeared in the years 1869-70, which were years of drought, the death of the trees being preceded by a copious discharge of resin. The year 1890 was distinctly characterised as one of excessive exudation of resin from the Sal trees."

We will conclude our notice of the Central Provinces Report with two extracts from the Southern Circle Report on (1) the important question of the liability to damage from insects of pure forests of teak ; and (2) the growth and seeding of bamboo, a subject to which Col. Doveton is well known to have long devoted special and careful attention.

In regard to the teak, he says :—"In the Ahiri forest the tendency of teak to establish itself to the exclusion of other species has become very marked in all the small areas which prior to fire protection were blank, and in such places during the past year the damage done by the destruction of the foliage of the young trees by insects has been altogether excessive. The results in those once blank areas are a good illustration of the necessity, in most parts of the Ahiri Reserve, of precautions to guard against the creation of a pure teak forest."

And in respect to the bamboo :—"With reference to paragraph 8 of the Government of India Review of the Report for 1890-91, it may be noted that the culms of bamboo attain their full size in a very short space of time, and it is an established fact that if, within the 15 days from the time of their starting from the rhizomes, the rain-fall is not copious, the culms fail to develop, and often wither and die off before attaining more than a foot or two in height. It is, however, also an established fact that in

'many cases the bamboo ceases to throw up shoots preparatory to seeding. The seeding of the bamboo, however, is to some extent connected with a diminished rain-fall, and hence it generally happens that the seed of the *Dendrocalamus* is obtainable in greater abundance in seasons of scarcity than at other times.

'In parts of the forest in the Sironcha taluqa there has of late years been tolerably extensive seeding of the bamboo. In a few favourable localities the reproduction of the species has progressed favourably, but over a very considerable area it may be said that the species has almost entirely disappeared, owing probably to the want of protection from fire and the impoverishment of the soil resulting therefrom."

The Ebony '*Diospyros Ebenum*' (is not *D. Melanozylon* or *D. tomentosa* really meant, for *D. Ebenum* is a denizen of the evergreen forests of the dry Carnatic country and hardly we believe goes so far north as the Godavari. It is not given in Brandis.) is said to reproduce almost exclusively by suckers and to make a grand show of foliage in the hot weather when other trees are not in leaf.

In taking up the *Bombay* Report for 1891-92 we are reminded that that for 1890-91, a memorable one in many respects, has never been reviewed in our pages. The discussion on the, what we consider, unnecessarily severe remarks of Government on that Report was a matter of considerable notoriety last year and evoked an expression of outside independent opinion in the Public Press on the question of the action of Forest Officers in regard to compounding offences under section 67 of the Forest Act. The *Bombay* Government objected, as that of the Central Provinces has done this year, that the offences compounded were too 'trivial' and on this the *Times of India* wrote as follows :—

"The conclusion arrived at by the local Government, that their Forest officers have availed themselves far too freely of the powers entrusted to them under Section 67 of the Forest Act, and that these officers have exacted compensation in a number of trivial cases which would most undoubtedly have been dismissed by Magistrates seems to indicate that the very object of Section 67 has been lost sight of by the authors of the Resolution. Surely, this section is primarily intended to be utilized in respect of so-called trivial Forest offences. If not, it might just as well cease to have a place in the Forest Act. It would be absurd to apply it constantly in the case of serious offences, which the Legislature undoubtedly intends should be dealt with by the Magistracy. It is meant to apply to trivial cases, and the Legislature in passing it fully recognized that the trivial mischiefs and thefts which the *Bombay* Government now make so little of could not be passed over. Compounding, obviously, cannot have been intended for serious offences."

Of course it may be that in some places forest prosecutions, or the compounding of offences, may have been occasionally harsh when they referred to ignorant people who did not know the rules,

But we believe this is not the case in Bombay and that most of the offences are cases of deliberate breach of the law. If the Government thought that the Forest Officers ought to be more lenient, we submit that private and quiet instructions to the Conservator could have effected the desired result without the scandal of the Government publicly and in strong language condemning a hard-working body of its officers for doing what is admitted to be their duty. It can hardly be expected that officers thus publicly censured for what they believed they were right in doing, will continue to work with the zeal and energy which Government would wish its officers to exercise and which have been so long the characteristics of all Indian Departments, and certainly not least of all the Forest.

The Report we have before us is, we suppose, the last one of the old arrangement of Circles, and in that of the Northern Circle, Mr. Shuttleworth has gone into great detail, probably foreseeing that another year he would only have half of the area to discuss.

The grazing question as usual occupies a considerable amount of the Report and it refers to the introduction of new rules as follows :—

“The new grazing rules were brought into force in the Sholapur division in the year of this report for the first time, and the differentiation of grazing was as under :—

- ‘(1) Fee grazing on permits in open forests.
- ‘(2) Free grazing on permits in open forests to agricultural and milch cattle, in villages which have contributed gairán to forests :
- ‘(3) Grazing on special areas ; valuable kuran sold by auction

‘The season for grazing extends from the 16th August to the 31st March ; and the close season against grazing, during which period cattle are excluded from the open forests, extends from the 1st April to the 15th August”

The account of natural reproduction is interesting chiefly on account of the damage done by a caterpillar to teak trees in the Thana District. The following are the Conservator's remarks on the subject

“Natural reproduction is very vigorous everywhere in the Thana district whether from seed or from stool : an enormous number of seedlings, however, are killed annually by fires or by cattle, whilst many die in the hot weather ; given protection from fire and grazing and mischief, the forests everywhere may be trusted not only to maintain themselves, but to increase in value. The regrowth in the closed compartments which were recently coupes under exploitation is generally vigorous and very luxuriant, so that the regeneration of the forests and their enhanced condition at the end of the rotation now being pursued may be expected with confidence. The new growth in the coupes is principally coppice, but a fair number of seedlings come up :

'the latter, however, suffer more than the former when fire over-
'runs the compartment. The seeding in the Thana forests was very
'bad during the year, especially in the case of teak trees; the heads
'of flowers were numerous on the teak trees, but in most cases
'became barren, and often where drupes had formed, it was found
'that the seeds contained had not ripened. A great deal of damage
'was done to the teak by caterpillars during the rains and up to
'the second week of November, when they suddenly disappeared;
'these caterpillars were of small size, greyish black, with a
'brown head, and were in such myriads that the leaves of
'all the teak trees in the district were reduced to skeletons of
'net-work, the caterpillars eating all the parenchyma of the
'leaves, and leaving only the fibres intact. The effect of this
'visitation on the trees, especially on young seedlings and coppice
'shoots, the tender leaves of which were especially toothsome to the
'caterpillars, must have been disastrous upon the increment of
'wood, besides weakening the trees; it is a noticeable fact that
'the trees broke out into new leaf much earlier in 1892 than
ordinarily."

We have been interested to read the records of success in artificial reproduction by means both of transplants and of sowings—babul seed sown broadcast by Forest Guards came up thickly in the Kamthi Budrak Reserve and in the Panch Melhals similar sowings of various trees appear to have been very successful. The following extract is interesting both as a record of successful results and as an indication that the Bombay Forest Officers have been more successful than their comrades in most other Provinces in getting the Forest Guards to help in the work. Our experience is that a Forest Guard, though he may have previously been a labourer, when once he dons the uniform and the belt, becomes at once much too fine a gentleman to do manual labour and objects to having to cut creepers and tend plantations in the way in which the French 'Garde Forestier' is accustomed to do. We congratulate the Bombay Officers on their success in this way and hope that the arrangement will extend, though of course it must in many places be accompanied by a reduction in beat areas.

"Though the season was excessively wet in Gujarât, the rains held off completely during June in the Surat division, whereby plantations were much delayed. Exploited coupe No. 1 of the Gandera Reserved Forest was sown up in pits 1 foot deep and 6 feet apart, with seeds from the Dangs: seedlings locally raised were also planted out in it, teak occupying every alternate pit, and in the month of November 1891, the whole surface was carpeted with seedlings and shoots; blanks were planted up in reserves in all the ranges by transplants of naturally sown seedlings from surrounding forests without outside help, and in addition thereto by broad-cast seeds over a larger area. The results are satisfactory. The Goema Reserved Forest now exhibits a very interesting spectacle to a forester; its site was barren waste land in the knowledge of the writer of this report, 23 years ago, and it

'was then sown up chiefly with babúl ; and seedlings of teak, of *Terminalia*, *Anogeissus*, *Dalbergia*, &c., raised in nurseries, were planted out subsequently among the babúl ; the latter grew up to marketable size, and has been cut out at different times after it had been overtopped by the teak and junglewood saplings, which are now entirely suppressing the few remaining babúl trees in the struggle for the survival of the fittest, while the receipts already obtained by the sale of the exploited babúl wood have more than paid the expenses of creating a very rich little forest estate.'

The remarks of Mr Shuttleworth on the utility of prickly pear on the one hand and its harm on the other will, we trust, be read with interest. But we think he is wrong in calling it *Opuntia Dillenii* and suggest his having it identified at Calcutta or Kew.

We believe it is the fact that the species *O. Dillenii* is rather a rare one in India, for there are several species of prickly pear in the country, all of them occasionally troublesome and mostly very different in appearance, having flowers red or yellow and leaves green or grey, etc but all the same even in such works as Brandis, 'Forest Flora' *O. Dillenii* has always been spoken of as the Indian Cactus. It was left for Mr J. Steavenson of Madras to point out the mistake and to shew that there were many species naturalized in India. It is quite probable that a little botanical investigation will shew that in the Bombay Northern Circle, there are several species and not only one.

"The eradication of prickly pear, *Opuntia Dillenii*, natural order Cactææ, from Reserved Forests in several divisions, has been carried on with vigour. This pestiferous plant, which is a native of Brazil, and now so common about most of the Deccan villages where it provides a safe refuge for wild pig, snakes and vermin of sorts in its dense impenetrable tangled masses, which form an unbroken cover over acres of ground, was introduced into Western India, so native tradition explains, by a Maratha Sirdar Dábhádé by name, who brought a few seeds of it in his palanquin from Delhi, and his gift has been as noxious to the Deccan as was the shirt to Hercules. It is a very valuable plant for the reboisement of the barren and denuded uplands of the Deccan, for it establishes itself upon the most stony ~~soilless~~ places, and it refuses to be turned out when it has once taken root, save at great cost and labour ; filth and debris are arrested by it and accumulate round it, and its own roots open out the pores of the earth and form soil. The natives call it the *nágphana nivadung* ; armed plants such as the *Euphorbia neriifolia*, *Nivulia*, &c., are likewise generally termed "*nivadung*" in the vernacular, with Sabri and Thor added to denote their species : but the prickly-pear is called the *nagphana nivadung* because its obovate, flat, fleshy joints resemble the expanded hood of the cobra. It is a very common mistake among officials and others to speak, and to write, of the Sabri, *Euphorbia neriifolia*, as a Cactus, which it has no claim to be, and thus confusion is caused. The prickly-pear is botanically called the Cactus

'*indicus* by Roxburgh in his *Flora Indica* The *Opuntia Dillenii* is enormously aggressive with its very great power of spreading, for the joints strike root wherever they may find themselves carried and dropped by man, or by the wind, or by water, and the seeds are deposited in all directions by birds, which eat the fruits, and when once this plant has been introduced upon a boundary line as a living hedge, an office it discharges very effectively, it very soon invades the property it was originally brought to protect. New growth, seedlings and shoots, come up here, there and every where, and as it is very gregarious it soon occupies land to the exclusion of superior vegetation and of grasses. It has to be cut down limb by limb and levelled to the ground, then the roots have to be dug up, and the whole carcass buried under several feet of earth; this is the most effective method of eradicating it; simply cutting it down, drying the severed parts in the sun, and burning them, which is a costly proceeding, will not always destroy the persistent vitality of the plant. The nine-lived cat would have no chance against the prickly-pear in a competition against death by violence. In the East Khandesh division, where there is not fortunately much prickly-pear, the beat guards dig it out wherever it shows itself. In the Násik division, an area of 670,248 square feet within the Raolas Reserved Forest in the Niphád range was cleared of prickly-pear at a cost of Rs. 103-5-0. In the Ahmednagar division 16,179 cart loads of prickly-pear were removed from 366 acres 26 gunthas of bábul forests in different ranges, and the material was buried in mounds and rifts under two feet of earth, the cost of the operation amounting to Rs. 1,034-8."

"In the Poona division ten gangs of six men each have been engaged partly as famine work for varying periods in the Haveli, Indapur and Bhimthadi ranges in digging out prickly-pear and trimming the hedges of this interesting plant, wherever it was getting beyond bounds 73½ acres were cleared entirely and 7,131 cart-loads of the prickly-pear were destroyed. Forest guards removed all young and fresh growth from the forests of their beats. Rs. 1,960-1-3 were expended in the division.

"Prickly-pear was removed from the Burlé bábul reserve in the Tasgaon range by hired labour, at a cost of Rs. 198-12-6; and creepers were severed and killed by forest guards in the forests of the western ghats in the Satara division.

"All the forest guards of the Sholapur division are equipped with bill hooks to keep their reserves free of creepers and also to remove freshly intruding prickly-pear, and paid labour has been employed where the forest guards were unable to cope with the evil."

The Sind Circle Report has an interesting account of 'Kachas', or, as they are perhaps better known in Northern India, 'Churs' which we must leave for future notice, there not being sufficient space for remarks and extracts in the present number

Mr. Hexton has an amusing paragraph on the impossibility of utilizing what he calls 'scientific forestry' in Sind which we reproduce though we do not quite agree with him. Indeed, as the Commissioner points out, he himself has in a further paragraph devised means for a working plan as he "has come to the conclusion that a 12 years' rotation is best suited to produce a regular supply of fuel," and taken steps accordingly ! Whether he will succeed in providing for a demand *equal to twice the annual yield* remains to be seen.

"Place the cleverest Continental Professor of Forestry in Sind, and say to him here you are in charge of 1,000 square miles of forest, one-third of which is incapable of reproduction ; your rainfall is next to nothing, and part of your forest area may or may not be watered by inundation ; you must remember that you are liable to lose thousands of acres by erosion, but you must be prepared to supply about double your annual yield, and you must not fail to show a net revenue of between two and three lakhs of rupees. Now, produce your working plans, remembering that in your plans for reproduction and conservancy you must for the time being forget your Continental ideas of grazing, and be prepared to give to villagers the rights and privileges conceded to them by the Revenue Officer ; and you must bear in mind that your controlling staff will consist of yourself, one European Assistant and three Native Sub-Assistants." The look of utter despair on the face of the poor Professor and the expressions that would escape his lips, as his position began to dawn upon him, may be better imagined than described. He would simply be staggered. We should hear very little use made of such scientific phrases as "reboisement" and "artificial re-generation," he would quickly be brought face to face with "the factors of the locality," and he would soon be an authority on "the hygroscopicity of sands." In short, he would find himself surrounded by - unlectured-of, unread-of and unheard-of conditions. His beautiful theories, one by one, would be cast to the winds ; he would be compelled to feel his way so gradually, and adapt himself so completely to his surroundings that in a few years his forestry would be of a decidedly empirical character."

Mr. Hexton is, we think, mistaken in his conception of the meaning of 'Scientific forestry.' Scientific forestry as we understand it, means the adaptation of what have been shewn by experience to be the best methods of treating forests to the circumstances of a particular locality ; and though possibly he would not think so, his reverence for the professor being so great, he is himself a scientific Forester when he determines from his experience that 12 years is a sufficient rotation and that the plan of work must be simple, and then sets to work to frame a working plan based upon these conditions.

We will conclude by saying that we are glad to notice the tone of conciliation adopted in the Bombay Government Review. We hope and trust that conciliation will continue and that steps will be taken to revise the rules and again put the relations of Revenue and Forest Officers on a footing which is likely to succeed. Let the Collector by all means represent the Department in his District and take full responsibility in doing so, but let that suffice. Assistant Collectors and Mamlatdars should have nothing to say to forest matters, and if the Collector has to instruct them in matters where their work is connected with forests let his orders go through his Forest Assistant, as in Madras, and not direct. We hope they will now cancel the absurd Rules of last year and have a new and proper arrangement such as will be equally approved by both the Revenue and Forest Officers.

VI-EXTRACTS, NOTES AND QUERIES.

New Indiarubber Rules in Assam.

The new rules introduced during the year with the sanction of the Government of India by which the old system of farming the collection of rubber was abandoned and replaced by the imposition of a duty of Rs. 12 per maund, on all rubber imported from beyond the border, or collected from trees growing on Government forest land, have worked very successfully from a financial point of view, the receipts from the duty collected during the past season having amounted to over Rs. 50,000 as compared to Rs. 25,585 received from the contractors in the previous year 1891-92.

The Rules only came into force on 1st November 1892, and there was naturally some little delay in getting them understood by merchants and others interested in the rubber trade. But when this was accomplished, the rules seem to have worked fairly well and to have given no cause of complaint to either hill man or trader. And although the exports of rubber were 1800 maunds less than usual up to 31st of last March, the returns of the following three months ending 30th June 1893 prove that the trade has pulled up its lee way and even exceeded figures of recent years.

Royal Scottish Arboricultural Society.

The fortieth annual general meeting of the Royal Scottish Arboricultural Society was held in the Bible Society's Rooms, St. Andrew Square, Edinburgh. Professor Bayley Balfour, president of the Society, occupied the chair, and eighty-five new members were elected.

The President, in his address, congratulated the members on the prosperous state of the Society. In the matter of the accession of new members the present was a record year, and the Society now numbered 600; and they had further evidence of its prosperity and influence in the success which attended their efforts to promote the cause of forestry in this country. In this connection he reminded them that Colonel Bailey, in his introductory lecture to the University forestry class last year, had referred to the fact that in specifications issued by the Board of Agriculture, with reference to works to be executed under the Lands Improvements Act, the use of home-grown timber was prohibited. This restriction had been discussed, and the Society had, through Mr. Munro Ferguson, entered into communication with the Board of Agriculture. The result had been that the protest of the Society had had effect, and the objectionable prohibition respecting home-grown timber had been removed for Scotland so far as concerned work under the control of the Board of Agriculture—an eloquent tribute to the usefulness of the Society as representing the voice of forestry interests in Scotland. Their clear duty now was to follow up what they had already done by a vigorous inquiry into the forms of contracts insisted upon by all other departments which made specifications involving the use of timber, so that they might altogether remove the stigma which had become attached to home products. The President referred, in passing, to the Forestry Exhibition at Earl's Court—an undertaking from which he personally did not see that much credit could redound to the society which had given its patronage, nor advantage to forestry. Turning to educational matters, he expressed satisfaction at the success which had attended the operation of the scheme for teaching practical foresters and gardeners at the Royal Botanic Gardens. The course had been opened in November last, and lectures had been given up till now in chemistry, physics, entomology, mensuration, and land surveying. The attendance at the classes had been excellent, and the examinations satisfactory all round; and as to those under instruction, he would defy anyone to find a finer body of men. He looked forward to a fruitful continuance of the course, and he took exception to observations upon the course by the chairman of the Forestry Committee of the Highland and Agricultural Society. He thought it was unfortunate that reckless assertions of that kind, which were not calculated in the least to promote the cause of forestry, should be made by those professedly

speaking in its support. With reference to University education, the past year had been not uneventful. Forestry had now been assigned a place in the University curriculum for B. Sc. in agriculture, and though it was at present an optional subject, yet with the realisation of the importance of the forestry, further recognition of its right place would come. Colonel Bailey had carried on vigorously the course of lectures at the University, having an attendance of thirteen students, and those whom it was expected would take advantage of such a course were just those who attended. He reminded them that the ultimate realisation of their hopes of a professorship foundation ought not to satisfy their aspirations for the future of their science. They must confess, indeed, that after several years of effort, it was a little disappointing that the endowment of the Chair at which they were aiming was no nearer being reached. It was a misfortune that landed proprietors did not see their interest in the direction to which the Society pointed, and unquestionably the general circumstances of the time did not favour the accumulation of such a fund as the Society sought to establish. But he raised the question whether there was no other way by which they could gain a more advanced position towards their goal. Technical education was no longer a vague expression. It had passed beyond that to the stage of specialisation, and it should be the aim of all those in whose power the regulation of such education was placed so to foster it that it should most efficiently supply the needs of the population in whose midst it was established, and that cognate subjects with a common foundation should be taught in combination. In Edinburgh they might claim to be a great horticultural centre. They had to remember that in many respects forestry, horticulture, and agriculture were cognate subjects, and the question he asked was whether there was no way by which some concentration could be brought about? When he noted the good work that was being done by co-operative effort in such an institution as the Science College at Newcastle-on-Tyne, he sighed for the time when in Edinburgh they would have combined their energies, and in a similar, even more extended college, carry on with effect and at minimum cost education in the subjects he had mentioned. He believed the thing was possible, and the question was how that concentration should be developed and the college he spoke of established. It appeared to him that the utilisation of existing endowed institutions would be the simplest and right method of procedure, and that it was possible for the Town Council, acting with characteristic liberal spirit, to give the college he suggested. The foundation of it appeared to him to be already laid. The Town Council was trustee of the Royal Veterinary College, and therefore specially interested in that institution, which had not yet, he believed, come into the full use of its endowment. Was not that the college that should be utilised as a centre around which a representative technical college should be built up? Such

a college could be affiliated to the University, and made an integral part of it. To this institution the various contributions for that special education could be assigned, and the staff would be increased to meet the requirements of the time. The President indicated some of the details which in such a college would receive attention, and at the close, on the motion of Dr. Cleghorn, he was thanked for his address.

Eucalyptus and Malaria in Italy.

We have received from Mr. W. Coldstream, C. S., Deputy Commissioner of Simla, so well known as interested in Indian Arboriculture and as the author of an important work on Indian grasses, a letter just received by him from Signor Fortunato Cardinali, Secretary to the Agricultural Society of Rome on the subject of the work at the Tre Fontane Monastery to which reference was made in our June (p. 225) and August (p. 303) numbers. Signor Cardinali says:—

“It is true that many experiments have been set on foot in Italy with the object of ameliorating the hygienic conditions of malarious localities; but the results have not been very satisfactory because that exotic plant has only thriven with difficulty with us, probably on account of the difference between this and the climate of its native country, that is to say, Australia, where there exist immense forests with notable advantages as much from the hygienic as from the economic point of view. Here in Rome we have one example, near the estate called ‘Tre Fontane’; where the Trappist Monks have occupied themselves in making a plantation of Eucalyptus since 1866; and although they have expended considerable sums of money and taken especial pains, they have only succeeded in raising some hundreds of plants out of so many thousands put out and those plants of relatively poor growth.

‘The monks extract from the leaves of the Eucalyptus trees a liquor which is sold as an ‘antifebrile tonic’ but to fight the fever properly quinine is really wanted.

‘I know that the cultivation of Eucalyptus in Algeria has succeeded in giving excellent results.”

Signor Cardinali's letter seems to supply the answer to the queries put in Mr. Fernandez's letter in our August number; and the facts appear to be that a great deal of rubbish has been written about the Tre Fontane plantations which does not accord with the real facts of the case, which are that Eucalyptus planting has been a distinct failure in the Roman Campagna, just as it has been in so many places in India.

Douglas Fir for Tea Boxes.

Mr. J. B. Spence of Ceylon has made an arrangement with the Ottawa agent of the Rathbun Company for a trial shipment of shooks for the construction of tea boxes. Of all the woods submitted, Mr. Spence favoured the Douglas fir, of British Columbia, which he considers vastly superior to the wood at present obtained from Japan. Shipments of fir box shooks can be made direct from British Columbia to Ceylon, and Mr. Spence believes that the trade will soon become one of the most important branches of the lumber industry. The tea trade of Ceylon requires about 1,000,000 boxes yearly.—(*Timber Trades Journal*.)

VII.—TIMBER AND PRODUCE TRADE.

The Teak Trade.

The following extracts from the 'Timber Trades Journal' will interest our readers. We hope that before long we may see *Padouk* and *Pyinma* and other woods as regularly quoted in the trade lists as *Teak* is now.

"THE WOODS OF BURMAH.—According to an official report 'which we have received from Moulmein, the prospects of the teak trade there are not hopeful. Of late years, especially during the last two or three, there has been a great falling off in the exports. In 1888-89 the exports from Moulmein to the United Kingdom amounted to 22,783 tons, the next year they rose to 23,555 tons, but since then they have not exceeded 6,831 tons. The shipments to the Continental ports have not fluctuated considerably during the last three years; but a drop from 2,511 tons in 1891 to 1,457 tons in 1892 is recorded in the exports to Egypt and Cape Colony. The shipments of wood other than teak have hitherto been of a somewhat experimental nature, but with regard to the Indian trade in these woods the Conservator of Forests in the Tenasserim Circle regards the outlook as encouraging. The demand for sleepers is active, owing to the new railways. Heretofore these have mainly consisted of *Pyinkado*, but the difficulty of its conversion (it is one of the hardest woods in the Indian forest) has led to experiments with *Kanyin*, *Ingyin*, and *Pyinma*. The latter has proved very successful, but the two former have been failures. *Pyinma* is said to be almost as good as teak."

"SIAM.—Siam has lately come into general prominence and everyone has learned something about the country in order to join in the morning-train conversation. Fortunately a report is just to hand from the British Consul-General at Bangkok, from which we learn that British shipping is responsible for 87 per cent., of the tonnage of the port, and that the value of the teak exported therefrom last year was £62,793. Much progress has lately been made with the Bangkok-Korat railway, for which 30,000 sleepers have been delivered during the present year. They are of excellent hard wood from the west of Siam, at Kanburee and Ratburee, where it is found in abundance. Our Consul also refers to a mania that the Siamese have for collecting the labels of match-boxes—a curious fact of interest to Swedish readers. Another report comes from Mr. Stringer, our Vice-Consul at Chiangmai in Northern Siam. He says that the export of teak has been unusually large. The teak forests of the Nan State have been very little worked as yet, for the local authorities have kept them in their own hands, but they seem inclined now to grant leases of some of the forests, which are said to be very valuable. The forests, in Chiangmai and Nan, drained by the Mekong and its tributaries, are only worked for local use, as logs cannot be sent down the Mekong to Saigon on account of the rapids. Thefts of the teak and of the elephants used in working on the logs, are the main drawbacks to the business, in which, in spite of the decline of the prices in London, British firms are taking a larger share. Woods other than teak are not worked for export, as they do not repay the cost of floating down."

Churchill and Sim's Circular.

September, 6th 1893.

EAST INDIA TEAK—The deliveries for the first eight months have been 8,783 loads, in comparison with 6,995 loads for that period of 1892, and 9,841 loads for the eight months of 1891. In August this year the figures are 1,157 loads against 574 loads in 1892 and 868 loads in 1891. The Dock stock is amply sufficient for present needs, but the improvement shown on the order books of shipbuilding firms, though hardly affecting the present situation, is satisfactory as pointing to a good consumption of teak in the future.

ROSEWOOD.—The stocks are not heavy; but in the absence of any improvement in the demand no sales have been made.

SATINWOOD.—*Logs*—the demand is very quiet, and therefore present stocks, although not large, are sufficient; planks and boards are not wanted.

EBONY.—The prices still rule low; but there is rather more demand.

PRICE CURRENT.

Indian Teak	per load	£9-10s. to	£15
Satinwood	„ ton	£5 to	£12
Rosewood	„ „	£5 to	£9
Ebony	„ „	£5 to	£7

MARKET RATES OF PRODUCTS.

(Tropical Agriculturist, September 1st, 1893.)

Cardamoms, Malabar	per lb.	2s.	to	2s.6d.
Croton seeds	per cwt.	20s.	to	27s.6d.
Cutch	„	20s.	to	23s.
Gum Arabic, Madras	„	15s.	to	50s.
Gum Kino	„	£15	to	£20.
India Rubber, Assam	per lb.	1s.7d.	to	2s.3d.
„ Rangoon	„	1s.7d.	to	1s.11d.
Myrabolams, Bombay	per cwt	10s.	to	11s.3d.
„ „ Godavari	„	7s.6d.	to	8s.
Nux Vomica	„	8s.	to	11s.
Orchella	„	12s.	to	28s.
Redwood	per ton	£3.	to	£3-10
Sandalwood, logs	„	£35	to	£55
„ chips	„	£9	to	£30
Sapan wood	„	£4.	to	£7.
Seeduc	per cwt	40s.	to	70s.
Tamarinds	„	8s	to	9s.

Cawnpore Price Current.

October 4th, 1893.

		Per md.			
		R.	As.	to	R. As.
Aonla fruits—dried	...	0	12	to	1 0
„ leaves dried and bruised	...	1	12	to	2 0
Babul bark	...	0	9	to	0 10
Bahera	...	1	12	to	2 0
Stick Lac	...	20	0	to	40 0
Myrabolams	...	2	8	to	3 8
Moonj Grass	...	1	4	to	1 8
Babul Gum	...	8	0	to	12 0
		8	0	to	8 0

THE INDIAN FORESTER.

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[No. 11.

A Tour in Jaunsar.

On the march from Mundali to Kathiyan we passed through some second class forest in the Ban oak zone which is burnt every year and used as a grazing ground : and then we came to a small patch of temporary cultivation in which the trees are lopped and the branches strewn on the ground and burnt, and the ashes ploughed in ; *khil* is the local name for this system.

Along the stream at the bottom of the valley, we noticed many new species among which *Cedrela Serrata* and *Quercus annulata* were the most important.

With regard to burning the 2nd class forest, we read in the Journal of 1891 as follows :—

“A greater part of the 2nd class forest below Mandali had been fired intentionally by the villagers. This procedure is allowed by the Forest Department, apparently as the villagers consider it necessary in order to improve their grazing. This, however, it does not do, as has been conclusively proved in Madras. In reality by firing the grass, most of the delicate annuals such as *Panicum Oplismenus*, *Isachne*, *Poa*, *Eragrostis*, *Festuca*, which are especially good for cattle, are destroyed, while the coarser kinds such as *Andropogon Nardus* and *Schœnanthus*, *Apluda aristata*, *Chrysopogon sp. sp.* and *Anthistiria ciliata* which are not so good for fodder, and of which only the young shoots are eaten, are encouraged.”

The climb up from the valley, through village lands, to Jakniani is steep and hot.

KATHIYAN FORESTS.

The area of the Kathiyan forest is 608 acres. The whole of the forest was burnt in 1865 by the neighbouring villagers of Chajal to propitiate their deity on account of a severe epidemic of small pox which visited them. The forest has been preserved from fire since 1870, and in 1870-71 the 1st and 2nd class trees which had been killed by the fire of 1865 were felled and converted into sleepers ; about 2,000 trees of each class were removed, and these yielded 10,000 broad gauge and 10,000 metre gauge sleepers. The sleepers were carried by men 12 miles to the Tons river and from thence floated singly to Dakhpathar.

The price then received for a broad gauge sleeper at Delhi respectively was Rs. 4 and for a metre gauge Rs. 2-8; the price now received is Rs. 2-8 and Re. 1-9 respectively.

Protection from fire has resulted in extensive reproduction of blue pine and deodar. On the south side of the hill above the village of Chajál, the deodar is quite as numerous as the blue pine, and in the struggle has held its own; the young saplings are growing quite as fast as the blue pine and have a healthy appearance.

On the north side of the hill it is probable that deodar at the outset was not so numerous, and thickets of blue pine 25 to 30 feet high have sprung up and suppressed the deodar. A casual observer might suppose that the deodar seedlings are much younger than the pine, but a careful examination of the annual rings of the former shows unmistakably that they are of the same age; the two species sprang up together shortly after the commencement of fire-conser-vancy, and the deodar has lingered on under the cover of the blue pine, but has not prospered. Operations to clear away the pine were commenced in 1886, but they were not carried out with sufficient vigour and boldness. Some oaks and other inferior species about 300 in number, were also girdled. In 1888, a party of students worked for ten days, and cleared away about 5,000 blue pine, girdled 2,500 oaks and other species, and liberated nearly 9,000 deodar seedlings, and though this operation was carried out rather late in the day, it is hoped that the deodar will prosper under the increased light given to them, and will now shoot ahead. The whole area has now been done, but it is essential to bear in mind that the place must be revisited every three or four years, and the operation, if necessary, repeated. We have seen that deodar is capable of existing under cover for many years; but it is quite possible that some of the original deodar seedlings have already disappeared. We must acknowledge, however, that, with one or two exceptions, we do not find any distinct proofs of this.

The deodar seed bearers were chiefly on the ridge at the top of the forest, whereas blue pine seed bearers were scattered about all through the forest, this fact mainly accounts for the preponderance of blue pine in the thickets on the lower slopes. The soil which is a deep loam may also have favoured the latter species.

"On the top of the ridge above the bungalow we inspected the patch of deodar reproduction marked out by the forest students in 1887; its area is 550 square feet and it then contained the following saplings:—deodar, 105; blue pine 85; spruce fir, 6; other species 2. In the middle is an old parent deodar tree, from which probably most of these young deodar have sprung."

This year we counted 97 saplings in the area, which would give about 7,682 per acre, the number in 1887, being about 12,120 per acre, an example of natural thinning. The number of deodar seedlings in a good seed year, that come up immediately under a parent tree is sometimes very large. We counted on one square

foot as many as 88 which had just germinated ; and in the Lambatach forest in 1888 we made the following remarks regarding natural reproduction of deodar and blue pine together, which are interesting as throwing light on the origin of these blue pine thickets :—

"On a grassy slope near the fire-line below "Dumbleton's" house, we counted the seedlings on a patch 10 feet by 10 feet and found 46 deodar of an average height of one foot, and 14 blue pine of an average height of nine inches. The deodar was about seven years old and the blue pine all ages from two to six : this would give about 20,000 deodar and 6,000 blue pine per acre. There were a good many deodar seed-bearers in the vicinity, which accounts for the large proportion of deodar seedlings but it is quite possible that in a very few years these 14 blue pine would completely suppress the 46 deodars. Hence it is absolutely necessary to watch such a crop from the very outset, and to clear away the pine as soon as they begin to get the upper hand of the deodar. Lower down on the same slope, the young stock is almost entirely composed of blue pine, and here it is probable that, at the beginning, there were very few deodar seedlings, because the locality is much further from the parent trees."

Near the Camp we inspected the result of the girdling of blue pine in 1888, and found that the girdled trees were quite rotten, and the average length of last year's shoot in the deodar was 13½ inches. The pine girdled in 1891, are now dying, their leaves being quite yellow. In 1892, we measured the lengths of the annual shoots of deodar of the last four years, in an area where the pine had been girdled, and found them to 6', 7', 9' and 9'1" respectively. These observations, as far as they go, tend to prove the beneficial effect of giving the deodar more light.

Tapping Chir Pine for Resin.

For a full account of these works the reader is referred to the Appendix Series of the *Indian Forester*, "Resin and Turpentine from Indian pines."

The following is a brief history up to date :—In 1884, 20 Chir trees were tapped on the Kumaon principle, i.e., a nick is cut deep into the tree and the resin is allowed to accumulate at the bottom of the hollowed out nick, and is collected from time to time. The nick is 18 inches high, 12 inches wide and 41 inches deep, at the base. The trees were tapped from April to November, and the yield was as follows :—10 trees in the Dharmigadh yielded 30 seers, and 10 trees in the Chatragadh yielded 86 seers of crude resin.

Resin tapping works on a larger scale were started in April, 1888. They were of an experimental character, and the cost of extraction was consequently high, and the yield of crude resin small.

1024 Chir and 501 Kail were tapped in the Bogar, Malen, Himus and Kathiyar blocks, 2,873 blazes in all being made, or nearly

2 on each tree. The work was begun by Dr. Warth and some forest students, and afterwards carried on by the local establishment.

Incisions were made 12 inches long and 6-9 inches wide. The cuts were freshened once a fortnight and at the end of November, 1888, were from 24 to 30 inches long, and 2 or 3 inches deep at the lower end.

The yield of resin in this year was 107 maunds or nearly 8 seers per tree.

In 1889, 1073 Blue pine and 3,215 Chir were tapped in the same forests, the yield being $2\frac{3}{4}$ seers and 6 seers respectively.

In 1890, 473 Blue pine and 115 Chir were abandoned as exhausted; and 1,540 Blue pine and 3,100 Chir were again tapped, but not worked to their full capacity, the cuts being freshened only once or twice a month. The yield was 37 seers of Chir resin, and 1 seer of Blue pine resin per tree.

In 1891 and 1892 the work was continued and there are during the present year 5,000 trees, all Chir, undergoing the process of being tapped.

The present system of tapping, which is adapted from the French, is as follows:—the outer bark is first of all removed for a space of several feet in height and about two feet in breadth; then an incision is made near the base of the tree, one foot long, 4 inches wide, and $1\frac{1}{2}$ inches deep, the instrument used being the native adze. A gouge chisel is then driven into the tree just below the bottom of this incision, into the curved cut thus made a strip of zinc 5 inches long and $1\frac{1}{2}$ inches wide, is driven by the handle of the gouge; this forms a lip which guides the resin into the pot placed below to receive it. This vessel is supported by a nail, and a piece of string passing round and fastened to nails on either side.

The pots are now made locally of unglazed earthenware at a cost of Rs. 2-8-0 per 100, or about 5 pies each. They were at first made of zinc, but these were soon abandoned, as they cost eight annas each, and were apt to be stolen by the hillmen.

The cut or blaze is freshened every eight days by taking off a thin strip at the top, $\frac{1}{4}$ inch thick and about 8 or 9 inches long; we examined several of these cuts immediately after they had been freshened and found the resin oozing out in bead like drops from 45 and 18 annual rings respectively. In the Chir pine, we believe, that the whole of the sapwood is capable of producing resin, but there are reasons for not making the cuts deeper, one being that it would require a very long time for a deep cut to heal over. The trees are frequently of large girth, and two cuts are made on each tree. At the end of the working season, the cut is about 2 feet high, and at the beginning of the following season, the pot is removed to the top of the old blaze and the work continued as before. Some trees are now being tapped, as an experiment, for the fourth and fifth year, but generally speaking, three years is considered sufficient for one continuous tapping. The tree is then abandoned and allowed rest.

The pots are covered with pieces of Chir bark to prevent foreign matter falling into them, but these are frequently blown off and we noticed that much of the resin was mixed with pine needles, chips, bits of bark, &c, which has to be strained out afterwards.

The resin is collected every eight days by a distinct set of men and taken to Kathiyan where it is stored in wooden tanks. From time to time it is packed and soldered up in old kerosine oil tins, and then sent on mules to Chakrata, on its way to Dehra where it is distilled.

During the season of 1892, the outturn of resin was 594 maunds and the cost of collection and carriage as far as Chakrata was as follows :—

(1) Tapping and collecting ...	Rs. 722
(2) Purchase of material	„ 21
(3) Soldering tins	„ 52
(4) Carriage to Chakrata	„ 76
	<hr/>
	Rs. 871

Or about Rs. 1-7-5 per maund, a sensible reduction on the cost of the previous year.

The trees yielded $4\frac{1}{2}$ seers each in Bagur block, and $5\frac{1}{2}$ seers in Karun.

The future of this industry depends on the sale of the turpentine. At present the whole of the resin or colophony is taken by the Soap Works at Meerut, and about two-thirds of the turpentine can be sold. Whenever the annual outturn of the turpentine can be disposed of, the tapping of the pines can be conducted on a larger scale. (Since the above was written, arrangements have been made for the sale of the turpentine to the N. W. Railway and it is almost certain that this industry will be largely developed.)

KATHIYAN TO THADIAR.

17th May—On this march, we proceeded along the Tons road, many portions of which are interesting from an engineering point of view. The average gradient of the road from Kathiyan down to Dharmigadh is 6° to 8° and we inspected the various bridges, retaining walls and railings, and witnessed some blasting of rocks to widen the road. Blasting is done by contract, the holes being made at a cost of 4 to 6 annas per foot, which includes everything except the cost of the powder. As a rule, one chittack of powder is used for every 12 inches depth of hole, but the amount varies slightly with the hardness of the rock.

The student's attention was also called to the excellent natural reproduction in the lower portion of the Chir forests in the valley, which had resulted owing to the area being protected from fire since 1885.

The Tons Chir Forests.

The following account of these forests is taken from the Journals of 1888 and 1891 combined.

Various fellings have been made from time to time in the Tons chir forests, the trees being marked by the Ranger or Divisional Officer and sold standing to contractors, who saw them up into scantlings and float them down to Dakpathar in the Western Dün. They pay about Rs. 5-4 for a tree over six feet in girth.

In 1878 it was proposed that sleepers of the chir pine should be impregnated with creosote or with metallic salts, and that works for this object should be set up on the Jumna. A report was prepared by Dr Warth on the subject of impregnation, (1) and the chir forests were inspected and surveyed by Mr. Smythies and a report on them submitted (2). But the railway Companies preferred deodar and the matter fell through. The question may, however, crop up again, when the deodar forests outside British territory have been exhausted and then the Tons chir forests will become important. As it is, there is such a great demand for chir timber that 4,000 first class trees could be sold every year. In 1879 it was estimated that there were nearly 200,000 chir trees above 6½ feet girth on the left bank on the Tons above Chattrra, but perhaps one-quarter to one-half were too heavily branched to yield sleepers or Karis.

In 1881 three hundred chir trees were sold to Mr. Spread for Rs. 3 each. These trees were 120 feet high and 12 feet girth, and were situated in the Khunigadh, close to the banks of the Tons; 4 or 5 trees per acre were cut. Mr. Spread's venture was not a financial success, the resulting natural reproduction was however very good.

No more Chir trees were sold until 1887, when 300 trees were sold for Rs. 6 each from the same area, leaving about 8 trees per acre on the area. The trees were cut from this area as the young seedlings which had come up required more light.

In 1891, 800 trees with an average girth of 7 to 8 feet and at a distance of two miles from the river, were sold for Rs. 6-8 per tree. A market for Chir wood has been made, and the wood is in great demand in the Punjab.

The trees are converted into karis 11 feet long by 5" x 4" or 5" x 5", which are carried to the banks of the Tons and there stacked. The stacks are covered with mud to prevent the karis cracking and to allow them to season. The karis are floated down the Tons after the rains.

Besides the trees sold standing, trees are also converted departmentally, and the resulting karis sold by auction in September on banks of the Tons. The Chir forests Working Plan provides

(1). Memorandum on the establishment of a Factory for impregnating pine sleepers from the North-Western Himalaya with metallic salts (Government Central Branch Press, Simla, No. 484R A. and C.)

(2). The Chir forests on the left bank of Tons river situated in Tehsil Garhwal and Jaunsar Bawar, dated 25th August, 1897.

that a certain area annually shall be worked departmentally, the number of trees to be removed annually being left to the discretion of the Divisional Officer.

In 1889-90 four hundred and thirteen trees of various sizes were cut on and above the Tons road fireline, as it was found that the dry needles which fall annually were a great source of danger in the fire season.

In the earlier fellings of 1881, the following measurements have been recorded as to the reproduction :—

					Ft.	In.
1886	52	seedlings, average height	...	2	9½	
1888	72	" " "	...	5	5	
1891	250	" " "	...	7	2	
1892	303	" " "	...	9	5	

The girth of a mature tree measured was 7 feet 7 inches and the average distance from tree to tree, before the felling took place was 34 feet, giving roughly 40 trees per acre.

In the older fellings of 1881, a final felling could now be made as the ground is completely stocked with seedlings, and young chir requires an unlimited supply of light. The contrast between these fire-protected forests and those annually burnt, as along the Dharmi-gadh valley, is most striking. There is very little undergrowth in these forests, with the exception of sandan (*Ougeinia dalbergioides*) but the grass is long and thick, and fire-protection exceedingly difficult, as the grass is ready to burn in November. The fire season is therefore eight months long. The chir seedling has a wonderful power of shooting up again when burnt to the ground, and on the fire lines and other areas burnt, we noticed many instances of young shoots springing up from the collum buds. During this process, which goes on year after year, the root becomes thicker and stronger, and eventually the young seedling may become strong enough to resist a fire; but there can be no question that many years' production is lost, and there is a chance of unsoundness at the base. Of all conifers with which we are acquainted, chir possesses the greatest power of withstanding fire.

The fireline along the Tons road is about 50 feet wide, and the upper limit is a two foot wide path, from which the grass is burnt downwards when sufficiently dry. In order to lessen the danger of fire spreading in May and June when the needles of the pine fall, a belt of about 100 feet wide above the fireline, has been completely cleared of the trees and in consequence there is excellent natural reproduction on this belt, the young seedlings being now 6 to 8 feet high. These, in their turn, will shed needles, and they may have to be cut down in a similar manner. It is essential to keep the fireline quite cleared of all inflammable matter during the entire season.

The valley of the Tons is rich botanical ground for the forest student, and many interesting species may be collected between Thadiar and the Khunigadh: among others *Cinnamomum Tamala* which yields the "dalchini" of the bazars.

Fuel Supply Works in Naini Tal.

Readers who may have resided in Naini Tal will be interested in a revised scheme proposed by the Conservator, Central Circle, in July, 1893, for the supply of fuel by Departmental Agency to the Naini Tal Settlement, which received the sanction of Government in September and comes into force on the 1st January, 1894.

For some years the firewood supply of Naini Tal was met by the collection by the *Jhampan* bearers of the residents—of dry wood which had accumulated in the neighbouring forests—who were licensed for the purpose at eight annas a head a month. In due course, the supply of dry wood was exhausted, and the *Jhampanies*, with licenses to collect what was not to be found, began to cut green wood, and continued to do so in spite of numerous prosecutions and punishments. Then certain trees were girdled and others cut in order to provide dry wood, and eventually the system of providing green wood in licenses at one rupee a head a month was sanctioned by Government and came into force during the current season.

The Conservator, after carefully going into the question, represented that this system was as faulty and wanting in permanency as were the earlier arrangements, and that it, too, must come to an end, and in the meantime result in the destruction of the forests within easy reach of the Settlement, upon which the *jhampanies*, consistently with their other duties, can draw. This conclusion was based on the following figures :—

Monthly wood tickets as issued at present are as follows :—

1st April to 31st October	...	...	3,000
1st November to 31st March	...	...	300
			<hr/>
Total	..	..	3,300

It was estimated that each ticket holder brings in 25 maunds a month, of which 10-12 maunds are delivered to his employer, a little is used, and 10-12 maunds are sold at a not lower rate than 4 annas a maund. The result is that 82,500 maunds of fire wood are removed from the forests, the resident obtains 10-12 maunds for a rupee, and the *jhampani* profits to the extent of Rs. 2-8 to Rs. 3 per month by the sale of wood. With regard to the quantity of fire-wood available, the Conservator worked out the areas set apart within the radius to which *jhampanies* can go, and found that they correspond roughly to 1,600 acres of completely stocked forest. The blanks could only be estimated and an arbitrary co-efficient of density applied, which was either taken from the Working Plan, or adopted from Conservator's own inspection of the areas,

but the result may be accepted, that at least five times the area in its present condition, would be necessary to meet the demand which might probably be taken at a round figure of 100,000 maunds, rather than at 82,500.

It was thought that the residents of Naini Tal could not reasonably expect to obtain their wood, at the sacrifice of all the adjoining forest, at 10 and 12 maunds to the rupee, while the same wood was being sold by their *jhampanies* in the Bazar, and even in their own compounds, at 4 maunds, and should a supply of good, dry wood be made available for them at about that rate, the Conservator was of opinion that they could have no just ground for complaint.

The pay of the *jhampani* is, at present, five rupees a month; but by the benevolent custom which has grown up and enabled him not only to supply his master with cheap fire-wood, but also to retail at his own price some 40,000 maunds of wood (his only title to which being that he has cut and carried it), he supplements his pay by $2\frac{1}{2}$ or 3 rupees a month, and thus receives a total of $7\frac{1}{2}$ or 8 rupees a month. Now, it cannot be denied that this is an extravagant price, and in excess of that ruling in other Hill stations, and when it is considered that it is paid by the gradual and certain denudation of the forests in the neighbourhood, the Conservator had no doubt it would be admitted that the time had come to make other arrangements and to bring the *jhampanies'* pay to a level with that of other unskilled labourers.

The proposal submitted by the Conservator was to abolish the system of issuing tickets and to establish four or five depôts at which the Forest Department should undertake to have on sale the requisite 100,000 maunds of fire-wood at Rs. 20 per 100 maunds. This would enable the Department to fell in suitable places at a distance beyond the radius within which the *jhampani* could go for his load and so to assure a constant supply and the maintenance of the forest.

The effect of this would be to (1) take away the *jhampanies'* perquisite in wood and so reduce his salary to Rs. 5, and (2) to give an ample supply of dry wood of good quality at about, or somewhat less than the rates now prevailing in the settlement, and residents could not reasonably complain of such a rate.

The old system was very tersely described by our friend and colleague, Mr. Fernandez, in his Working Plan report "as a premium for the European residents to entertain an army of liveried *jhampanies*," and its abolition is distinctly a step that should have been taken long ago.

Forest Administration in Oudh.

Given a long narrow strip of forest bounded on all sides with cultivation; burden the area with concessions in free produce limited to all villages within three miles of forest boundary but otherwise undefined; permit the concessionists to remove the free produce in such form and from such localities as best suits them; allow their cattle in any number to roam through the area, and what will be the condition of that forest after 25 years? The local administration of the Province of Oudh conceived in 1865 the idea that it was necessary to encourage cultivation and recoup the tenantry for the loss in crops and health consequent on proximity to the forests, by making certain concessions to the inhabitants of the country in the neighbourhood of State Reserves; and by executive order, ruled that all villages within 3 miles of the forest boundary might receive free produce for domestic and agricultural requirements and graze their cattle at preferential rates. For eleven years these orders remained in force without registration of villages, without definition of the amount of free grants or of the number of cattle to be grazed, and without allotment of locality for the exercise of the privileges; that is to say, that any village whose boundary fell within the limit of 3 miles from State Forests, might graze any number of cattle and remove any amount of produce from any part of the area! In 1876 a special commission was appointed to enquire into rights and privileges in the Oudh Forests and generally into their management in relation to the agricultural necessities of the Province. This commission recommended the continuance of concessions granted in 1865 but suggested alterations in the method of the exercise of these grants, pointing out that a register of 3-mile villages should be drawn up, and that concessions of free produce should be defined on the basis of the number of 1st, 2nd and 3rd class houses in each village. The Local Government ordered the registration of villages but found that the definition of concessions was unnecessary and in consequence, the annihilation of such forests where the burden imposed was excessive, continued.

In the years that followed, successive Forest Officers reported on the state of the Bhinga forests of the Bahraich Division; that the soil was utterly impoverished and incapable of allowing reproduction to proceed; that the young growth was being destroyed by the unlimited extraction of poles by concessionists, that the vast herds of cattle, averaging 2 to every 1½ acres, prevented the growth of any grass or shrub; and that the standing crop of trees of the upper age classes was drying up or decaying for want of nourishment. Little by little the closure to cattle of a portion of the area was permitted by Government and the soil in these areas speedily responded to the advantages afforded, by becoming covered, first with grass, and then with a good undergrowth of inferior species, amongst which, however,

no sal seedlings were visible. The closure was, however, only partial. The undefined liberality of Government had brought about a state of affairs as unpleasant as unexpected. Cultivation had not, as was originally intended, increased; but the attractions of cheap grazing and free produce had created a class of cattle breeders in the neighbourhood of the forest who systematically evaded the payment of fees; and who owned, besides an immense number of domestic cattle, large herds of wild cattle whose progress through the forest was uncontrolled and from whose depredations neither the closed forest nor the cultivated area was free, moreover the closure of a percentage of the forest drove the concessionists, in their search for free produce, in still greater numbers, to the now restricted open area, and it seemed as if it was hopeless to continue to contend against these adverse conditions, and that there was no alternative but to acquiesce in the destruction of the forest over at least two thirds of the area of the Range. Such was the melancholy outlook in 1893 when the compilation of a series of Working Plans for the forests of the Bahraich Division was in contemplation, and the proposals for the working of the forests of the Bhinga Range were met by the Inspector General of Forests with the objection that no working of any forest in which undefined privileges existed could be sanctioned; namely, that if the demand on the area in grazing and produce was not fixed, it would be impossible to make any proposals for its working during a term of years which could be of value. The self-evident justice of this argument was, of course, accepted by the Local Government, who approved of the principle that Government may extend their liberality in concessions to any extent within the annual yield of any forest but not to such an extent as to involve its deterioration or destruction and after due enquiry and consultation the following orders were issued.

I. That the number of cattle admitted to the privilege of preferential grazing should be limited to 4 bulls and 4 cows for every 10 pacca bighas of land cultivated within the area of a 3-mile village.

II. That the amount of free produce should be limited to the amount required for the upkeep of the present number of 1st, 2nd and 3rd class houses in each 3-mile village; and for agricultural implements to an amount also based on the cultivated area of that village.

III. That one acre per head should be allowed for the grazing of privileged cattle and the rest of the forest be closed to grazing with power to alternate open and closed areas in future years.

IV. That free produce would be given under the supervision of the Department, and as the Department might direct, from any forest within 8 miles of a privileged village, thus permitting utilization of the wastage of improvement fellings at a distance.

V. That, unless any valid objection was brought forward, the wild cattle should be captured in Kheddabs and sold at once to persons residing at a distance from the forest.

Twenty eight years have elapsed since the grant of undefined concessions in 1865, and sixteen since the commission appointed by government advised the definition of these concessions. The present Government has stepped in to stay the destruction, already nearly complete, of a large area of State forests ; but the harm done in 28 years of unrestricted felling and grazing will not be rectified in a day. Twenty or perhaps thirty years hence, the forests of the Bhinga range will show a richer soil and a promising advance growth, and future Foresters will hardly realize to what a parlous state the area had been brought in 1893, owing solely to the omission to define the amount of the concessions granted and the method of enjoying them.

O. C.

Fire Protection in the Landes of Gascony.

The text of a Bill, which has recently been introduced into the French Senate with a view to organizing fire-protection in the Departments of the Gironde and the Landes, appears in a late number of the *Révue des Eaux et Forêts*. We give an abstract of the proposed law which may interest our readers.

After specifying the territorial limits to which the Bill relates, it is laid down that the kindling of fire shall be subject to administrative rules sanctioned by the *Conseil d'Etat*. Article 3 provides that a person infringing any of the aforesaid rules shall be punished with fine varying from 20 to 500 francs, and may, in addition, be imprisoned for a period not exceeding five days. If the offender has previously been punished for a like offence, he may be imprisoned for from 3 months to 2 years ; and the responsibility of parents and masters for acts by minors or workmen is enforced. By Art. 4, forest guards, whether State or Communal, and any rural police officer may take cognizance of offences under the law. The most important portion of the Bill is that relating to fire-traces. Art. 5 provides that every owner of forest or land which has not been completely cleared of brushwood or dry timber, may be called upon by the owner of an adjoining estate of the same description, to open, and maintain in good order his share of a common fire-line running along the dividing boundary. The width of this trace will be fixed by the proprietors or, if they cannot agree, by the Justice of the Peace, after consulting the Conservator.

By Art. 6 it is proposed to render obligatory the clearing of fire-lines, 20 metres broad, along every line of railway open for traffic, expenses being defrayed equally by the companies and the adjacent proprietors. The Bill also provides for the speedy preparation of a general scheme of fire-lines of public utility and lays upon the *Maire*, or the forest officials, as the case may be, the duty of directing fire-protection measures, especially when it is necessary to have recourse to counter-firing.

Tour of the Coopers Hill Students in Germany.

The following account of the tour made by the Senior Forest Students from Cooper's Hill in the German Forests, may be interesting to some of your readers.

The tour was conducted under the able guidance of Dr. Schlich and the students were accompanied by Messrs. Reuther, E. Carr and Copeland of the Indian Forest Service.

We assembled at Frankfort on the Main at the end of April and on Monday, May 1st, accompanied by Forstmeister Henschell, started work in the forest belonging to this town. Sylviculture and valuation surveys occupied our time. We were introduced to the combination of agriculture with sylviculture. The system was in very general use a few years ago but is now only carried on in favourable localities, *i.e.*, in those free from severe frosts.

On May 5th we arrived at the University town of Giessen; here several instructive days were spent in the company of Dr. Hesse, who showed us, amongst other things, some experimental plots of Oak, Beech and Spruce, where different degrees of thinning were being tested, also a very elaborate nursery and a fine museum.

The Spessart Mountains, Bavaria, were next visited and we were here joined for a few days by Sir D. Brandis. The Spessart is a hilly tract of country, bounded on the West, South and South East by the River Main. It is divided into 12 Forest Ranges, four of which, Rothenbach, Rohrburn, Lohr, Waldaschaff, we examined from a sylvicultural point of view; the expeditions being conducted by Sir D. Brandis, who knows this part of Germany very well. Some magnificent oak and beech woods were seen here, the natural regeneration of the latter being so powerful that the former has to be protected against it when young. On Sir Dietrich's departure we were divided into parties each making a description of a certain compartment. A thinning was also made here.

On our way to the Saxon Forests we stayed a day or two at Bamberg. The woods here have suffered severely from very bad insect attacks and various interesting methods of prevention have been undertaken.

Schwarzenberg, Saxony, was reached on May 24th. The history of the Saxon Forests is interesting. At the beginning of the century, there was no Forest Conservancy at all. Rights of all sorts existed and the forests were in a deplorable state. In 1832 a law was passed empowering forest proprietors to demand a commutation of the rights which badly affected their lands. At present the management is excellent, as is shown by the fact that their revenue, after deducting *all* expenses—41 marks per hectare. Insects give great trouble in these woods and owing to the attacks of *Hylobius abietis*, it is impossible to make large cuttings in any one spot. Great ingenuity is shown in the formation and position of the cutting series so as to reduce this danger to a minimum.

On May 31st we went over the Fichtelberg in a snow storm and saw the effect of elevation on tree growth, and then had a passing glance at Austrian Forestry, on our way to Carlsbad. Here we were given a three days' holiday, re-assembling at Heidelberg on June 4th. From this well-known town we went to Vierheim, Hesse Darmstadt. The first attempt to employ agriculture for sylvicultural purposes was made here in 1810. It is now given up, however, the Scotch Pine being used as a nurse for the oak. The nursery here is curious. It is made under a shelter wood of Scotch Pine. These are left not only to shelter the beech seedlings but also that larger timber may be obtained.

Our tour in the Black Forest began at Baden-Baden on June 8th, sylviculture being the chief point of interest in the woods here.

At Herrenwies, which we reached on June 13th, a large amount of work was got through. After a tour in the woods, the parties made a description of three compartments and these, with some others included by Dr. Schlich, were tordmed into a neat and condensed working plan. One of the forest districts here, Forbach I, next to the Herrenwies dirtrict, belongs to several villages and a church. It is managed by the State Forest Officer. From the proceeds of these communal forests, roads, school houses, &c., are built and all the expenses of the municipalities are defrayed, so that there are no local rates, taxes or school fees to be paid, certainly an ideal state to live in, especially as, in addition, a sum of money is received by each villager. From here we travelled by Schönmunzach and Fremdenstadt to Kippenheim, the home of a fine coppice with standards forest. Owing to its situation, in the fertile Rhine plain, the coppice at the age of 30 years attains a height of 30 feet which is exceptional for these climes, I believe. From here Staufen, E Black Forest, and Shönau were visited, the latter by tramping over the Belchen. The object of the latter was to notice the change in vegetation. This was most marked, beginning at the foot with fine well-grown forests and ending in a grassy mound (1415 metres.) On July 5th we left Schönaue for Todtmoos, South Schwarzwald. In the 10 days we spent here, we built a charcoal kiln and saw it burnt and opened; made a thinning and saw some heavy timber let down a steep slope. We also visited several Black Forest cottages and saw the manner in which the wood is worked up by the peasants in the manufacture of tubs, baskets, brushes, boxes, kitchen utensils, &c. The facility with which they manipulated spruce wood was wonderful to watch. Of course, it broke, instead of bending, in our hands.

On July 13th we proceeded to St. Blasien where, at their Serene Highnesses' request, we were presented to the Grand Duke and Duchess of Baden.

Zurich, reached on July 16th was the last place visited. Here, under the able guidance of Forstmeister Meister, many things of interest to the forester were pointed out in the Siewald. Timber slides

and tramways were seen here in full working order, all the produce of the forests being worked up by the Forstmeister in his own factories before any sale is attempted. The machine for chopping up wood, turning out hatchet and broom handles, &c., were very ingenious and, in some cases, extremely simple.

This brought a most instructive and, thanks to the perfect management of Dr. Schlich, an extremely pleasant tour to a close.

E. P. S.

II.—CORRESPONDENCE.

A Bureau de Recherches.

SIR,

Under the heading of a "Bureau de Recherches" the complaint of want of matter for publication is revived. Translations, official excerpts and occasional touring observations, occupy most issues of the "Forester," but interesting as these are, they are not attractive to all, and the pertinent question has been asked, "Is the *Indian Forester* popular?" Without attempting to reply to the question, it is modestly suggested that increased popularity would spring from occasional energetic representations in the interests of the *personel* of the department. Room exists for fair discussion in this direction, due loyalty as Government servants being strictly observed, *e.g.* D. P. W. and Bengal Police appointments corresponding to our 1st and 2nd Grade Deputy Conservators are valued Rs. 1,000 and Rs 900* each, against Rs. 900, and Rs 800 and carry with them recognized positions on the precedence list. Conservators' appointments compare unfavorably with similarly important ones in all the larger departments. A Conservator serving under a Local Administration occupies on the precedence list, the position allotted to a second grade District Superintendent of Police. "Esprit de corps" has been prescribed as a forest maxim since Nancy produced such excellent specimens of Foresters, and this should induce much personal exertion to secure Forest Officers their due rights. By the way, your

* Rs. 850, D. P. W.

very able correspondent "Velleda" does not encourage "esprit de corps," when his contempt for brother Foresters not "Nancy men and Germans," appears, as it did recently, in the case of untrained officers and, more veiled in your last issue, of Cooper's Hill men. A recommendation to use less gall in his incisive writings and a study of the Commander-in-Chief's last speech at the Staff College dinner at Simla, is humbly presented. "Union is strength" and even the untrained man has his good qualities. Every Forest Officer must congratulate you personally on the improved issues of the "Forester" since edited by you.

"BORDER."

Inspection Note on Coimbatore Forests.

DEAR MR. EDITOR,

I have just received the *Indian Forester* for September, in which, under the heading of "Inspection Notes on the Forests of South Coimbatore, North Malabar, etc," you make certain comments on the fact that the Conservator's remarks were largely annotated by the District Forest Officer of the former Division. Now, with reference to this fact, I beg to inform you that it was solely under the Collector's orders that the marginal notes and replies were made and initialled by me, the Acting District Forest Officer. Of course, I *did* recognise that such a procedure was obviously objectionable, and not only recognised it, but also pointed it out to the Collector. The Collector, however, was not of the same opinion and I, of course, obeyed his orders on the matter. Trusting you will give publicity to this letter in the next Volume of the *Indian Forester*, I beg to remain,

H. B. BRYANT.

Eucalyptus in Hoshiarpur.

DEAR SIR,

I see in your October number a note on the growth of Eucalyptus in Hoshiarpur, and this has brought to my mind a tree that I think ought to answer the purpose of stopping the erosion in the "Chos" of that district. I refer to the *Acacia Melanoxylon*, which grows very rapidly, seeds plentifully, and sends up root suckers. As it comes from hot and dry Australia, I think it ough

to thrive in the Punjab. It has been tried in the Ranikhet Reserve, successfully, as far as growth is concerned, but there it has to contend with snow which it cannot stand. A considerable quantity of seed could be obtainable from these, however, for experiment elsewhere. And, if for nothing else, I think it ought to do very well as a roadside tree, considering its large size, very quickly attained, its handsome and thick foliage, and its yellow blossoms.

Have the authorities finally given up trying to do anything for the "Chos" of Hoshiarpur?—or is it not too late to suggest that patches—by preference the heads of ravines—should be taken up and enclosed and sown with this tree?—If, moreover, extensive enclosure is not practicable, it seems to me it should at least be possible to take up patches here and there and when grown, to open them and take up adjoining patches—but, of course, lopping would have to be prohibited.

T.

Forest Fires in America and India.

DEAR SIR,

I send you an extract *re.* Forest fires in Sajmanbury. I found that Forest fires crossed a fire line burnt off to a width of 100 yards in Wynad. As a rule, in heavy grass forests, I have found a line of the above width sufficient, provided it has not been cleared on the slope of a steep hill with high grass or bracken below the line. In such places during a fierce fire in March, when a high east wind was blowing, I have seen dead leaves, bracken, &c., whirled 120 yards and more when flaming, into the protected Forest beyond. I have only once seen a Forest itself actually on fire. A planter had fired a big clearing on a steep slope, and the result was that all the trees on the upper margin of the clearing and for a depth of some two hundred yards beyond, were scorched and died out. Some years afterwards, when the undergrowth that sprang up after the trees were killed was very dry, some one set fire to it. I never saw so furious a fire as resulted. Huge trees burnt as they stood and fell over with a crash. The roaring of the flames could be heard a great distance and the sight at night was very grand. It gave one some idea of what a large Forest fire in a pine forest in America must be like.

Forest fires.

The occupants of a cyclone-pit can, says a writer in *Lippincott's Magazine* (U. S. A.) defy the fury of the storm, and Professor Herkimer, of Lima, Peru, has devised half a dozen different models of dwelling-houses which an earthquake may shake, but never break, while the conflagration of a large pine forest reduces all living things to the alternative of death or instant flight. During the Saginaw Bay fires of 1875, Squire Wirth, of Gladwin County, had surrounded his farm with a clearing from sixty to eighty yards wide, in the hope of saving at least the main building, but the conflagration overleaped that barrier at the first attempt; the dwelling-house, barn, and several stables caught fire almost simultaneously from a shower of flying sparks that swept ahead on the wings of the gale. There are plants (such as reeds and swamp-grass) that would extinguish a camp fire as effectually as a wet sponge would quench the flame of a rush-light; but the fierce heat preceding extensive woodland fires turns all vegetable products into fuel. Green leaves turn brown, saplings wrinkle and twist, the gray tassels of Spanish moss curl up and turn as black as horse-hair—all ready to blaze at the touch of the first spark. At a distance of three hundred yards from the actual flames of a forest fire near Rockwood, Tennessee, a Fahrenheit thermometer rose at once to the top of the scale—i.e. to 180 deg. above zero, and would have burst its tube the next minute if the experimenter, wrapped up in wet shawls, had not snatched it away in the nick of time.

"Sparks fell all around us," says an eye-witness of the recent highland fires in Northern Oregon, "and the air felt like a flame, though the distance to the next burning trees was about a quarter of a mile. I have been working in the open sunshine in Fresno County, California, when the thermometer stood at 108 deg in the shade, but the temperature of that sun heat seemed mild compared with that of the atmosphere all around us, except on the east side of the house, where the night wind felt almost cool. My brother, who had run out to snatch a saddle-blanket from the fence, came back with his hands looking as if blistered, though he had managed to dodge the sparks. The heat on the west side of the fence was enough to roast the rosin out of a pine rail, and must have exceeded 200 degs, judging from the fact that the thermometer on our side porch had risen to 162 deg. several minutes before the rooms became untenable, both on account of the temperature and of the prickling odour of the smoke-clouds that penetrated through every cranny."

The damages caused by forest fires in the course of the last twenty years in the United States and British North America, has been estimated at eight hundred million dollars, a sum

which does not include the indirect loss from the destruction of game, insect-eating birds, &c, nor from the deterioration of climatic conditions, since tree-devouring fires are both a consequence and a cause of droughts. How completely and radically the vegetable life of large districts can be destroyed by intense heat, may be inferred from the fact that in the forest provinces of Brazil, where the woods are often burnt purposely in the interest of agriculture, an entirely new flora is apt to spring up on the *quemaderos*, or "charred" lands, as a proof that the original vegetation has been utterly annihilated. In Alleghany County, Maryland, dogwood roots were found scorched to a depth of 18 inches, though the ground around the demolished tree was not more than usually porous. A little ground squirrel was found dead in its burrow of about two feet of vertical depth; another in a somewhat deeper hole was still alive, but lethargised with heat or smoke. For most other animals the chances of survival are measured by the rate of speed. Instinct drives them towards the next clearings, and the proprietor of a large ploughed field gets often a chance to revise his estimate as to the animal population of an apparently uninhabited forest. Foxes, minks, woodchucks, rabbits, and weasles dart out of thickets that were supposed to harbour only lizards.

Compounding Offences in the C. P.

SIR,

I have, with regret, read the second Paragraph of your article on Page 386 of the 'Forester' which places a false construction on Paragraph 10 of the Resolution by the C. C. in which no censure has been conveyed, because the cases dealt with under section 67 had been trivial.

On the contrary the C. C. though considering that the administration in the Southern Circle had been harsher than in the Northern Circle, modifies this by an acknowledgment that the compensation clause had been applied to trivial cases only, that is such for which it was intended by legislation.

The correctness of this view is borne out by subsequent correspondence on the subject in which the principle on which section 67 has been applied has been approved.

BERT. RIBBENTROP.

We are glad to publish the Inspector General's letter and to thank him for it; and also to make our apologies to Sir Antony Mac Donnell for our misinterpretation of para 10 of his Review of the C. P. Report. It is a great satisfaction to make sure that the principle on which Section 67 should be applied is really understood.

HON. ED.

III.—OFFICIAL PAPERS & INTELLIGENCE.

The New Dehra Dun Forest School Rules.

SECTION I.—CONSTITUTION AND STUDIES.

1. The School is under the administrative control of the Inspector General of Forests, who is assisted by a Board consisting of—

1. The Inspector General of Forests, *President* ;
2. The Director of Public Instruction, North-Western Provinces and Oudh ;
3. The Director of the School ;
4. One Conservator from each province (not more than three serving in any given year) ;
with, as *Secretary*, the Assistant Inspector General of Forests.

2. The Superior Staff of the School consists of—

- | | | |
|-------------------------------|---|---|
| 1. The Director, | } | assisted by the Forest
Officers of the School
Circle, North Western
Provinces. |
| 2. The Deputy-Director, | | |
| 3. & 4 Two Instructors, | | |
| 5. The Vernacular Instructor, | | |

The Conservator of Forests, School Circle, North-Western Provinces, will ordinarily be Director of the School. The Deputy-Director and two Instructors are officers of the Indian Forest Service on the Imperial List. The Vernacular Instructor is an officer of the Provincial Forest Service, also on the Imperial List.

3. The Director of the School is charged with (1) the general administration of the institution, including the regulation of the course of study under the arrangements prescribed by the Board of Control, subject to the sanction of the Government of India ; (2) the supervision of the School buildings, quarters and garden ; (3) the control of the accounts, and the conduct of correspondence.

4. *Courses.*—There are two courses ; one in English, the other in the Hindustani language. Each course lasts 21 months. The English course is that followed by the "Upper Class ;" the Hindustani course that followed by the "Lower Class." The first year's students are called "Juniors" ; the second year's students, "Seniors." In the English course students are prepared for the certificate in Forestry by the "Higher Standard" ; in the Hindustani course, for that by the "Lower Standard."

The subjects taught in these courses are the following, described in the School syllabuses :—

1. Forestry, including Sylviculture, Utilisation and Forest Working-Plans ; both theoretical and practical.
2. Mathematics—Elementary Arithmetic, Algebra, Trigonometry, and Mechanics ; in their application to forest questions.
3. Physical Science, including Chemistry, Physics, Physiography, Geology, Mineralogy and Soils
4. Botany, both theoretical and practical ; including the collection and preservation of plants.
5. Zoology—the classification of animals and the study of useful and dangerous species, especially of insects, including the collection and preservation of specimens.
6. Drawing, Surveying and Estimating ; as required for forest officers.
7. Forest Engineering, theoretical and practical.
8. Forest Law, the elements of Criminal Law, and departmental organisation.
9. Forest Accounts and Procedure.

5. *Terms.*—The terms of study are as follows :—

1st year—	Rains term—July 1st to October 31st, in Dehra Dun.
	Winter term—November 1st to December 22nd, in camp.
	Vacation—December 23rd to January 5th.
	Spring term—January 6th to March 31st, in camp.
	Hill tour term—April 1st to May 31st, in camp.
2nd year—	Vacation—June 1st to 30th.
	Rains terms—July 1st to October 31st, in Dehra Dun.
	Winter term—November 1st to December 22nd, in camp.
	Vacation—December 23rd to January 5th.
	Spring term—January 6th to February 15th, in camp.
	Examinations, including survey test—February 16th to March 31st.

6. *Examinations.*—The School Examinations are :—

1. Monthly, to test progress and application.
2. Final.

The *Monthly Examinations* are usually held on the last two working days of each month, as the Director may order. The marks obtained at these examinations are counted for one-fourth of the aggregate at the Final.

The *Final Examinations* are held in March of the second year and the marks then obtained count for three-fourths of the aggregate.

7. *Certificates*.—There are two certificates obtainable in each class, after the final examinations: a “pass” certificate and a “honours” certificate. The former is granted to students who obtain over 50 per cent. of the aggregate marks allotted to all subjects, provided this includes 50 per cent. of the marks allowed for each of the subjects of Forestry, Botany, Surveying, and Engineering. The latter is granted to students who obtain over 75 per cent. of the aggregate marks allotted to all subjects, including over 50 per cent. in each individual subject. These certificates are only granted on the orders of the Board of Control, who have authority to exercise their discretion in doubtful cases.

8. *Prizes*.—The School medals are awarded by order of the Board of Control, but only if “honour” marks (75 per cent.) have been obtained. Other prizes, whether given by Government or other donors, are also awarded by the Board of Control.

9. Should any student of the three categories enumerated in Rule 11, be unable (a) to appear at the final examinations, or, having appeared, (b) fail to pass those examinations, he will not be permitted to appear at any subsequent final examination, unless he follows a second time the whole course of instruction at the School, or, at the discretion of the Director, the second year's course.

SECTION II.—ADMISSION RULES.

10. The total number of students of each class who can be admitted into the School each year will be limited to such number as the Board of Control may decide, from time to time, can be accommodated in the School. The number of studentships to be allotted each year to the respective Provinces, as well as the number of nominations to be made by the Director, will, with due regard to the total prescribed by the Board of Control, be decided by the Director of the School before the 1st January, after consultation with the Provincial authorities as to their requirements and communicated to the Local Governments concerned.

A.—Upper Class.

11 *Class*—There are three categories of Students in the Upper

- (1) Private Students.
- (2) Students already in the Government service.
- (3) Students deputed by Native States.

12 *Private Students* comprise all those students who are at present without appointments in any Forest Service, and whose object it is, by becoming possessors of Forest School certificates, to obtain employment, either in the Forest Service of the Government of India, or in that of a Native State or some other owner of forest property.

(i) Candidates for admission to the Forest School as private students must not be less than 18 or more than 25 years of age, and their applications must be sent to a Conservator of Forests* through a Divisional Forest Officer of rank not below that of an Assistant Conservator of the 1st grade, or through a Collector or other district officer. Neither the Conservator, the Divisional Forest Officer, nor the Collector need belong to the forest circle or province in which the candidate seeks employment; but Divisional Forest Officers and Collectors may not forward to Conservators applications unsupported by the five certificates enumerated below, namely:—

*Conservator of Forests, Bengal Circle, at Darjeeling.
 Conservator of Forests, Assam Circle, at Shillong.
 Conservators of Forests, North-Western Provinces and Oudh—
 School Circle, at Dehra Dun.
 Central Circle, at Naini Tal.
 Oudh Circle, at Naini Tal.
 Conservators of Forests, Central Provinces—
 Southern Circle, at Nagpur.
 Northern Circle, at Jabalpur.
 Conservator of Forests, Berar Circle, at Amraoti.
 Conservator of Forests, Punjab Circle, at Lahore.
 Conservators of Forests, Upper Burma—
 Eastern Circle, at Mandalay.
 Western Circle, at Mandalay.
 Conservators of Forests, Lower Burma—
 Pegu Circle, at Rangoon.
 Tenaasserim Circle, at Moulmein.
 Conservators of Forests, Madras Presidency—
 Northern Circle, at Bezwada.
 Central Circle, at Madras.
 Southern Circle, at Coimbatore

(a) A certificate that the candidate is a "Native of India," within the meaning assigned to those words by section 6 of 33 Vict, Cap. 3. †

(b) A certificate of age

(c) A health certificate, in the form prescribed by article 61 of the Civil Service Regulations, signed by the Civil Surgeon of the district in which the said Divisional Forest Officer's or Collector's duties lie, and testifying to the candidate's sound constitution, good vision and hearing, general physical fitness for a rough out-door life in the Forest Department.

(d) A certificate of respectability and good moral character from two or more persons whose social or official position can be accepted as a guarantee of reliability.

(e) A certificate from an officer of the Educational Department, of a rank not less than that of a Deputy-Inspector of Schools or the Head-master of a High School under public management, to the effect that the candidate's education appears sufficiently good to give hopes of his being able to pass the entrance examination.

† 'Native of India' means any person born and domiciled within the dominions of Her Majesty in India, or within the territories of Indian Princes tributary to or in alliance with Her Majesty, of parents habitually resident in India, and not established there for temporary purposes only. (Article 45, Civil Service Regulations.)

The last three certificates must bear date not further back than the 1st October of the year preceding that in which the candidate proposes to present himself at the entrance examination.

If any person, giving certificates as above under (c), (d) and (e), is in a position to mention anything more to the credit of the candidate than the certificates actually call for, he may do so.

- (ii) Upon the receipt by the Conservator of any application in respect to which the preceding conditions shall have been observed, that officer may either accept or reject the application, without assigning any reason for so doing ; or he may require the candidate to produce other or better certificates in person before him.
- (iii) Conservators may, at their option, test the fitness of a candidate who desires to enter the service of Government by practical work in the forests.
- (iv) Those candidates who have been approved by the Conservator will be permitted, under his recommendation, to appear at the next entrance examination for the Forest School held in his circle.
- (v) The *Entrance Examination* is held early in March each year, on such date as may be fixed by the Director, both at the Imperial Forest School and at such centres as may be fixed from time to time by Local Governments, and under such officers, Educational, Revenue, Forest or other, as may be appointed : provided that the date shall be communicated by the Director to Local Governments and Conservators on or before 1st January. The subjects of Examination are :—

		Minima pass marks.	
1. English	Conversation	... 50	per cent.
	Composition	... 33	"
2. Arithmetic	...	... 40	"
3. Algebra, up to and including quadratic equations	...	... 40	"
4. Elements of Euclid, Books I to IV and Book VI	...	... 25	"
5. Mensuration—lengths, areas and volumes, with examples		25	"

The examination papers on the above subjects will be forwarded by the Director, in sealed covers, to such officials as the Local Governments may direct, in the month preceding the examination.

- (vi) A Local Government may lay down rules under which the number of candidates allotted, under Rule 10, to the Province for admission into the School, shall be selected from the number of passed candidates.

In such rules due regard must be had to the place taken in the examination, but the Local Government shall not be debarred from preferring, for good and sufficient reasons, a passed candidate who may have taken a lower place in the list to one higher on the list ; provided that the Director may, after inspection of the papers of the selected candidates, place before the Local Government an objection to the admission of any of such candidates on the ground that he is below the required standard.

- (vii) The Local Government may, if it thinks fit, exempt from the entrance examination any candidate who is a Bachelor of Arts, or who has obtained a degree or diploma of about the same standard, at any University in India or in the United Kingdom or in a British Colony, or at any educational institution to which the Government of India may extend the privilege : provided that such degree or diploma shall not give such candidate a preferential claim over any candidates who have passed the entrance examination and who may appear more eligible for the Forest Service.
- (viii) Prior to the admission of a student, his parents or guardians must satisfy the Director that they are willing and able to defray the expenses of the student at the School. These expenses are estimated to be not less than Rs. 735 for each student living in native fashion, and Rs. 945 in the case of those living in European fashion (*vide* Rule 21). Of these sums, parents or guardians must deposit with the Director before the course commences, a sum of Rs. 126 in the case of native students and Rs. 168 in the case of European students, to meet the initial cost of uniform, books, instruments, stationery and camp-equipage (*vide* Rule 18), and, in addition, Rs. 50 as caution-money.
- (ix) Local Governments may, on the recommendation of a Conservator or of the Director, and in exceptional cases, allow selected private students who have passed the entrance examination, a monthly stipend not exceeding Rs. 50, to assist them through the School course ; provided that such selected private students previously execute an agreement binding themselves to serve the Local Government concerned (in the event of their obtaining the School certificate) for a period of not less than five years (*vide* Rule 17). Such monthly stipend may, in case of misconduct or unsatisfactory progress at the School, be reduced or altogether withdrawn at the discretion of the Director.

- (x) The names of those private students who succeed in obtaining the School certificate will be entered by the Director in a register to be kept for that purpose, and the Conservators of those circles, in which the non-stipendiary private students may severally desire or be willing to serve, will be addressed by him with the view of obtaining appointments for such students. The Conservators concerned will, for this purpose, be furnished with the original certificates already referred to in clause (i) of this rule, the School certificates, and such other useful information, more especially regarding the physical qualifications of the students, as the Director may be in a position to furnish.
 - (xi) A list of private students, who may not succeed in obtaining appointments, will be forwarded by the Director to the Inspector General of Forests, who will circulate the list amongst Durbars, Conservators, and other persons likely to be in need of the services of trained forest officials.
 - (xii) The appointment to the service of Government of passed private students depends on the existence of vacancies in the various circles, and even a stipendiary student has no claim to such appointment.
18. *Candidates in the Government Service*, who may be deputed to the School, will ordinarily be either—
- (a) members of the Provincial Service (Forest Rangers) who desire to qualify themselves for further promotion in their own or to a higher class ; or
 - (b) members of the Subordinate Service (Foresters and other subordinate officials) similarly desirous of qualifying for promotion.
- (i) Forest Rangers may be deputed by Local Governments, provided the candidates are certified, by the Conservator under whom they are serving, to possess sufficient knowledge of English and general education and ability to enable them to profit by the course. Such officers may be above 25 years of age, and need not pass the entrance examination. While at the School they will draw the pay of their grade, and the travelling allowances to which they may be entitled under the Civil Service Regulations.
 - (ii) Officers of the Subordinate Service may be deputed by Local Governments, provided that—
 - (a) they have been in that service for not less than three years ;
 - (b) they have passed the School entrance examination ;
 - (c) they are under 25 years of age ;
 - (d) they have executed the formal agreement referred to in Rule 17.

Such officers will, while at the School, draw the pay and travelling allowances of their grade in the service ; provided that the total amount sanctioned to meet the cost of their training, inclusive of travelling expenses, shall not be less than Rs. 735 in the case of students living in the native style, and Rs. 945 in the case of students living in European fashion (*vide* Rule 21).

14. *Students deputed by Native States* may be admitted on the request of the State concerned ; provided that—

(a) they have passed the entrance examination of the School ;

(b) they have produced the certificates required for admission, specified in Rule 12 (i).

The Durbars of Native States sending students to the School shall, before the beginning of each term, or of each year if preferred, deposit with the Director a sum sufficient to meet the expenses of the Students. This sum, for the whole course, must not be less than Rs. 735 for students living in Native fashion and Rs. 945 for those living in European fashion (*vide* Rule 21).

B.—Lower Class.

15. There are also three categories of Students in the Lower Class—

(a) Private students.

(b) Students in Government service.

(c) Students deputed by Native States.

The rules for admission to the Lower Class are the same as those detailed in Rules 12, 13, and 14 for admission to the Upper Class, with the following exceptions :—

(i) Instead of the Entrance Examination, the candidate must furnish a certificate of having passed the Middle Class Examination in the North-Western Provinces and Oudh, or an equivalent standard in another Province as well as a certificate that he possesses a competent knowledge of Hindustani.

(ii) The cost of training will not be less than Rs. 588 (*vide* Rule 21) for the whole course of 21 months.

(iii) The required deposit will be Rs. 84, and the caution-money Rs. 25.

C.—General.

16. No student of European or Eurasian extraction, not already in the permanent employment of Government or of a Native State, shall be admitted into the Forest School if he is married, nor shall any such student, whether in the permanent employment of Government or of a Native State or not, marry whilst at the School or until he has joined a permanent appointment. A breach of this rule will render the student liable to dismissal from the School, or to forfeiture of any appointment in the Forest Service which may have been promised to him, or to which he may otherwise have a claim.

17. *Agreement and Security Bond.*—Officers of the Subordinate Service, deputed to the School by Local Governments under Rules 13 (ii) and 15, shall execute a formal agreement—the sureties for the fulfillment of which should be men of position and means—to continue in the Forest Service of the Local Government concerned for a period of not less than five years after passing out of the Forest School and on such rates of pay as may be in accordance with the existing organisation of the Department. A breach of this condition will render the defaulter and his sureties liable for the refund of the entire cost of the student's education at the School. The agreement and security bond shall be in the appended forms, and must be executed before the student is admitted to the School. The agreement will be signed by the student and, if he is a minor, by his father or guardian also; the bond by the student and two sureties. The amount of security to be taken will be—

		Rs.
For a Lower Class student	...	600
„ an Upper Class { Native	...	750
Student { European	...	1,000

The agreement and security bond need not be stamped.

The same rule shall be apply to private students who may be granted stipends under Rule 12 (ix), subject, however, to the proviso of Rule 12 (xii). Should any such student not be appointed to the Forest Service of Government at the end of his School Course, his agreement and security-bond will be returned to him.

18. *Uniform, book and camp allowances.*—The Director is authorised to make deductions from the pay of Forest Ranger students under Rule 13 (i), or of students of the Subordinate Service under Rule 13 (ii) and 15, or from the stipends of private students under Rules 12, (ix) and 15, to the following amounts:—

	Rs.	Rs.
Lower Class Students	4 monthly, or	84 in all
Upper Class Students { Native	6 „	126 „
{ European	8 „	168 „

in order to meet the following items of initial expenditure, viz:—

		UPPER CLASS.		Lower Class
		Native.	European.	
		Rs.	Rs.	Rs.
Uniform and equipment	..	20	50	20
Books and instruments	..	60	60	24
Camp outfit	...	46	58	40
		126	168	84

The Director will charge off in his accounts such portions of the above as may be necessary from time to time to meet expenditure on the items mentioned, until the whole of the amounts are exhausted, after which the student will be required to pay in cash for articles supplied.

19. *Travelling allowances of private students in receipt of stipends.*—Students holding stipends from Local Governments under Rule 12 (ix) are not entitled to travelling allowance; but, as the tours entail greater expenditure in some months than in others, the Director is authorised to make a further monthly deduction from the stipends, of Rs. 5 from Upper Class Native students and Rs. 7 from Upper Class European students, and to disburse the amounts in the following manner :—

		Native Students.	European Students.
		Rs.	Rs.
Monthly travelling allowances	{ Novr.-May, 1st year	4	8
	{ Novr.-Mar. 2nd "		
	Or for 12 months ...	48	96
	Special additional allowance for Hill tour	22	16
	" " " for Punjab "	35	35
TOTAL ...		105	147

20. Should the Conservator of a Circle from which any Government student of the Subordinate Service is deputed to the School, under Rule 13 (ii), prefer it, he can, subject to the orders of his Government, authorise the Director to pay travelling allowance to such student at the rates given in Rule 19, instead of at the rates allowed by the Civil Service Regulations. And in the case of Lower Class Government students, deputed to the School under Rule 15, he may similarly authorise the payment of travelling allowance at the following rates, instead of the rates permissible under the Civil Service Regulations :—

			Rs.
Monthly travelling allowance at Rs. 4. ...	...	..	48
Special hill tour allowance ...	...	...	16
" Punjab tour allowance ...	...	...	20
Total ...			84

which rates are equivalent to a permanent travelling allowance of Rs. 4 per month for the whole course.

21. *Estimated expense of training.*—It has been calculated that, in addition to the amounts specified in Rule 18 for cost of uniform, books, &c., and camp-equipment, and in Rules 19 and 20

for travelling, the minimum monthly subsistence money for students comes to Rs. 20, 24, and 30, respectively ; so that the minimum pay and travelling allowances of Government students under Rule 18 (ii), and the minimum stipends for stipendiary students under Rule 12 (ix), should not be less than Rs. 35 and Rs. 45, respectively, nor should the minimum pay and travelling allowances of Lower Class students (Rule 15) be less than Rs. 28. Thus, the minimum cost of training will be as follows :—

		Lower Class.	UPPER CLASS.	
			Native.	European.
		Rs.	Rs.	Rs.
Subsistence money	...	20	24	30
Uniform, books, and camp outfits	..	4	6	8
Travelling allowance	...	4	5	7
Total per mensem	..	28	35	45
Or for the 21 months of course	...	588	735	945

The same amounts should be taken as minima in calculating the allowances to be deposited on account of students from Native States under Rules 14 and 15, or provided by parents and guardians for the cost of training of private students.

SECTION III.—DISCIPLINARY RULES.

22. *Quarters.*—The Director will allot to students, on their arrival in Dehra, such quarters as may be available in the School buildings or in the houses rented by him for students' accommodation. The School quarters are tenable during the whole period of the students' course, and the rent is Rs. 2 monthly for each student, or Rs. 4 for each room. Students for whom there is no accommodation in quarters or in houses rented by the Director, or who may prefer it, can, with the permission of the Director, reside in the town in lodgings selected by themselves ; but in that case the Director will accept no responsibility for the rent.

All students, living in quarters or in the rented houses, are expected to abide by such orders as the Director may issue from time to time for the purpose of ensuring cleanliness and sanitation.

No dogs are allowed in quarters, nor may dogs or horses be brought inside the School grounds.

Breakages of furniture, etc., in the quarters or School buildings must be paid for by the students. Students are responsible for the acts of their servants.

23. *Uniform.*—All students must wear the School uniform which consists of a suit of khaki drill with white-metal buttons, and a grey turban of prescribed pattern, for the hot weather, and of khaki serge with similar buttons for the cold weather and camp. Those students who become members of the Dehra Dun Mounted Rifles are, however, permitted to wear the undress uniform of the corps, which also consists of a suit of khaki drill, of pattern similar to that of the School. Students who are Volunteers will wear, as head-dress, a brown shikar hat while at the School, and the regular corps helmet when on parade. Native students may dispense with turbans, or wear other head-dress, only with the Director's special permission. Uniform must always be worn inside the School building. It must also be worn in the School grounds up to 5 P. M.

24. *Uniform and Camp Equipment.*—The uniform of members of the Dehra Dun Mounted Rifles may be obtained through the corps staff; that of other students through the Storekeeper of the School, on the Director's order. As camp equipment each student requires—

- (1) A small tent, not larger than 10 feet \times 8 feet.
- (2) A camp bed.
- (3) A small camp table.
- (4) A camp chair or "morah."

These articles are made at the School and issued at cost price to students.

25. *Books and Instruments*—The list of books and instruments required by each student will be published by the Director from time to time. The articles must be purchased from the Director, who endeavours to obtain them of the best quality procurable, consistent with cheapness. No article will, however, be issued by the Storekeeper, except (a) on order of the Director, or (b) on cash payment.

Copies of the Forest Acts and Forest Code, as also surveying instruments and herbarium presses, are issued on loan, and students using them will be responsible for their safe-custody, and return.

26. *Leave.*—During the course of instruction, no student may leave Dehra without the written order of the Director. Nor may students, while in camp, leave the camp head-quarters without the written order of the Deputy-Director or the Instructor in charge. Subsidiary rules regarding leave will be made by the Director from time to time.

27. *Holidays.*—During the rains term, Saturday will usually be observed as a holiday or devoted to excursions. In camp, it will ordinarily be a half-holiday. Such of the usual gazetted holidays as are allowed will be notified as such from time to time.

28. *Punishments.*—Students are liable to the following punishments :—

- (1) Reprimand by the teacher in class.
- (2) Reprimand by the Director or the Deputy-Director at any time.
- (3) Reprimand before a meeting, convened by the Director, of not less than three School officers, one of whom must be either the Director or the Deputy-Director. The proceedings of the meeting will be reported to the Conservator or the Native State deputing the student, or to his parents or guardians if he is a private student; and, if the meeting so decides, a note of them will be made on his final certificate.
- (4) The Director, acting with the consensus of the meeting referred to under (3), has power to inflict, in addition, a fine to the extent of one-third of the salary or allowance of the student for a period not exceeding three months.
- (5) The Director, acting with the consensus of a full meeting of the School officers presided over by himself, has power to dismiss any student for misconduct; and a student thus dismissed cannot be re-admitted to the School. The Director may remand any student who, in his opinion, is not sufficiently promising.

29. *Monthly Reports.*—A progress report on the work of each student will be issued monthly by the Director. It will record the number of marks obtained by the student at the last monthly examination, his application to his studies, and his conduct generally. It will be sent, for Government students or private students in receipt of stipends, to the Conservator of the Circle from which the student is deputed; for Native State students, to such person as the Durbar may direct; and for ordinary private students, to the parent or guardian concerned.

30. *Library.*—The books in the School Library are available for the use of students under such rules as the Director may make from time to time. Books of reference must be consulted in the library itself, and no books may be taken away except after application to the librarian and entry in a register.

31. *Museum.*—The Museum and Herbarium are also available for the use of students; but the objects in the museum may not be handled or removed without the express permission of the Director or the Deputy-Director. Permission to consult the herbarium may be obtained from the Director or the Deputy-Director, but the plants must be kept in their order as arranged, and no sheets removed or altered without permission.

32. *Athletic Sports.*—The gymnasium and the tennis-courts will be available for the use of students during all recreation hours on week-days. Cricket and football may be played on the old parade ground. Students are recommended to join the School Athletic Club, the subscription to which is Rs. 4 yearly, and half-rates for those who do not play all the games.

IV—REVIEWS.

The Madras Forest Administration Report for 1891-92.

In reviewing, last August, the Forest Reports of the Madras Presidency for 1891-92, we referred to the results of the system under which the Conservation had been pushed into the background in order that the control of the administration of the Department should be managed entirely by the Board of Revenue. There can be little doubt but that this has led to the increase of expenditure in the shape of clerical establishments who have, of course, to justify their own retention and maintain their appointments, and we cannot help thinking that this clerical staff is really at the bottom of the reasons for the great administrative mistake committed in allowing the professional agency of the Department to be set aside. Apparently, the matter has also attracted the attention, not only of the Government of India but of the Secretary of State, as will be seen from the following extract, to which we draw attention, from the Government of India Review.

“The record of the progress made during the year was for the first time compiled, from the various district reports, in the office of the Board of Revenue. The Report, especially in those parts of it where technical subjects, such as working-plans, natural reproduction, &c, are dealt with, is wanting, in a sufficient summary of the more or less disjointed statements which are brought together but not reviewed in many of its pages. The Government of India are therefore pleased to observe that the previous procedure, under which each Conservator prepared a consolidated report for all the districts in his Circle, is to be restored. The submission of the Conservators’ reports, with such brief remarks as may be necessary to draw attention to points requiring notice, will facilitate a comparison between the administrations and will tend to lessen the large amount of business which devolves upon the Board and to which the Secretary of State drew attention.”

We may hope that with such a consensus of opinion against them, the Madras Government will now adopt the proposals of the Government of India, to which the writer in the 'Madras Mail,' whom we quoted in August referred, and adopt the plan of having a Central Committee of Conservators acting under the Presidency of the Revenue Secretary, to manage its forest affairs and to get rid at one sweep, of the cost of the interference of the Board of Revenue, and the grievance which the Conservators naturally feel at the lowering of their position.

' Report on Forest Administration in the Jeypore State for 1892.

In our Number for September 1892, we reviewed the Jeypore Report for 1891, which Report was then prepared by Bhai Sadhu Singh. Bhai Sadhu Singh has since then returned to the Punjab and his place has been taken by Lala Shiva Bakhsh, who is the writer of the Report for 1892. The Control of the Jeypore Forest Department is now no longer under the State Engineer in Chief but under the State Council presided over by Babu Kanti Chunder Mukerji, C. I. E., Rao Bahadur, the Prime Minister, who it is said "takes a very keen interest in forest affairs." We have read Lala Shiva Bakhsh's introduction with great interest and we think it right to reproduce, as follows, a rather lengthy extract from them, as we think it fair to show that the teaching of the Forest School and the influence of British Forest Officers, has not been in vain and that there are some Native Foresters who carefully and well appreciate the advantages of forest conservancy and value of forests in dry regions like those of Jeypore.

ADVANTAGES OF FOREST CONSERVANCY.

The advantages expected to be secured by forest conservancy in this State, as in the other provinces of the British Empire, are of two classes—direct and indirect. The direct advantages are easily defined. They comprise the provision of a permanent and sufficient supply of timber, wood, and other forest produce for local use, iron-smelting, and the trade generally. The indirect advantages are the influence of forests upon climate, the underground and surface-drainage: in a hilly country, forests protect the surface soil against erosion, and diminish the quantity of sand and silt carried down by rivers. They help to fix moving sands, afford shelter against winds particularly against the scorching ones of the hot season; and that during the dry season, well-stocked forests tend to increase the atmospheric moisture and dew in their immediate vicinity. For the direct advantages of

forest conservancy, it is of the greatest importance to produce on the smallest area the largest quantity possible of useful timber, wood, and other forest produce, and it is necessary to determine the yearly quantity which, under good management, can be produced permanently on a given area.

It is important to determine the rate at which useful and marketable forest produce, such as wood or timber, can be produced in different localities and under different systems of management. Without accurate knowledge of these matters we work in the dark.

Forestry is as yet a new business in the State, and in order to secure success at the beginning, it is necessary to deal with the problem of forest protection in its easiest form; so at the outset the protection of compact areas of suitable size with convenient boundaries was undertaken. It is a fact that lands in the neighbourhood of well-stocked forests are more productive than those situate at a distance from the forest. It must be distinctly recognized that not only does the provision of fuel come within the legitimate scope of forest administration in Jeypore, but one of its most important duties will, in future, be to increase the supply of cattle-fodder, particularly during seasons of drought.

The importance of this feature of forest administration is not yet fully recognized. It is in this matter chiefly that forest conservancy may be expected to mitigate the disastrous effects of seasons of drought and famine. The importation of grain can be facilitated by the construction of additional roads and railways, but cattle-fodder cannot, to the same extent, be distributed over the country; it must either be produced on the spot in the vicinity of the villages, or the cattle must be driven away to places where pasture is available. The want of grass and the consequent mortality among cattle has always been one of the principal evils attending fodder famines, and this evil can, in many cases, be mitigated by forest conservancy. The lands in the immediate vicinity of well-stocked forests will have a more abundant, and at the same time a more permanent, supply of timber, firewood, branches of thorns for fences, leaves for manure, and of cattle-fodder, and they will have the advantage of heavier dew in the dry season, and of protection against dry scorching winds; and in most cases they will have a more certain supply of water in streams, springs, wells, and tanks. In this manner forest conservancy, if properly understood and methodically carried out, will improve the condition of the lands enclosed within, and situated in the vicinity of, the forests, and will thus promote the extension of cultivation. The aim which should be steadily pursued in regard to the management of the wood and forest lands at the disposal of the Raj is to effect a sharp separation between fields, grazing grounds, and forests.

GRAZING. GROUNDS.

A more extensive management of the pasture lands is another subject which must be kept in view. In most of the States in Rajputana, extensive preserves of grass and brush-wood are maintained according to ancient custom, either as the property of the State, like the Ramnas of Bharatpore and Kishan-garh, or as the property of the great nobles who own a large portion of the land in Meywar. During the terrible famine of 1867-68, while the cattle of the British districts of Ajmere and Merwara died or had to be sent away, these preserves, in several of the Native States of Rajputana, were of the greatest value in enabling the people to keep a portion of their cattle near their villages. In the fodder famine of 1891, grass was supplied to the Government at Ajmere from the Jeypore State birs, while the Jodhpore peasants for want of fodder emigrated to Jeypore and the adjacent British districts of Ajmere and Agra. In seasons of drought, pasture is available in the forest lands, when there is none in the open grazing grounds. It is not only that in such cases there is more grass under the shelter of the trees, but the leaves of the trees themselves serve as fodder. The growth of trees on grazing grounds combined with closing them against cattle in rotation, and the establishment of grass preserves to furnish cut grass during the dry season, in which cattle only graze after the grass has been cut, and which will be protected against fire, should have a treat. The growth of forest is primarily influenced by the climate, and in Rajputana the most important climatic factors in regard to forest growth are rainfall and atmospheric moisture.

EFFECT OF FORESTS IN PROTECTING THE SOIL AND REGULATING SURFACE AND SUB-SOIL DRAINAGE.

Forests protect the soil on slopes and hills, and there is good ground for believing that they regulate the distribution of the rain-water which falls upon the ground and the surface and underground drainage. In this respect the action of forest is one, we believe, most beneficial in a tropical climate.

The action is that the foliage breaks the force of the rain, which therefore falls upon the ground more gradually and gently; the loss by evaporation is less; decayed leaves, moss, twigs, and other matter on the ground in the forest act as a sponge and prevent the rapid downflow of the water; the soil, which is permeated by the roots and is mixed with vegetable mould, is loose and facilitates the percolation of the water which comes out at a lower elevation in the shape of springs. Less soil is washed away from the hill sides, and less sand and silt are carried down by the rivers.

The effect of forest upon the moisture in the soil is, however, of a most complicated nature. For while, on the one hand, the evaporation of rain-water is diminished, there is, on the other hand, no-doubt that, under certain circumstances, trees and forests tend to dry up the soil, the roots drawing up moisture often from great depths which is evaporated by the leaves. The rain which falls upon the catchment area divides itself into three unequal portions. The largest portion evaporates, while smaller quantities flow off on the surface, and a third portion sinks into the sub-soil, re-appearing at a lower level in springs and streams.

In a well-stocked forest a fourth portion is retained by the branches and foliage.

Alienation of Raj waste lands is also checked by forest administration.

PRIVATE FORESTS.

Zemindars or other large proprietors whose forests have been devastated by reckless cutting or otherwise, or who may desire to conserve them in order to protect the water-supply in rivers or for other purposes, may be induced to apply for assistance in managing their forests. The Rajaji of Khetri has an intention of conserving his forests. The assistance may be given by the Thikana employing a separate officer, who will carry out the regulations for the management of the forests. When professionally trained and experienced rangers and foresters are available for the charge of private forests, their owners will be found willing enough to avail themselves of their services. When State forests are successfully maintained, the example of yielding a good and steadily increasing revenue to the State will induce private landholders to imitate the example thus set them.

At the time when Colonel Jacob, the State Engineer, gave up the general control of the Forest Department in the Jeypore State, which event was soon afterwards followed by the transfer to the Punjab of Bhui Sadhu Singh whose ardour in carrying out the original proposals made by Mr. Mc. A. Moir deserves the greatest praise, it was feared that the Forest Conservancy arrangements in the Jeypore State were likely to suffer.

From the present report, however, it seems that this has not been the case and this satisfactory state of affairs can only now be attributed to the great interest taken in the Forest work by the Prime Minister. In Forest matters especially, a steady and progressive policy in the matter of closing Forests to grazing and firing is of the greatest importance and reserves once closed should not again be opened until fit for it, except in the case of the most urgent famine arrangements.

In fact, too much stress cannot be placed on the great importance of closing altogether to grazing as large areas as are practicable in dry regions like Rajputana, as the amount of damage done by all kinds of animals, and especially browsers, reaches its maximum in such localities. The Jeypore State forests have scarcely changed in area during the year, they have now about 278 square miles or nearly 2 per cent of the area of the State. The forests are managed in four ranges and by degrees trained officers from Dehra are being employed in the management.

Out of the 278 square miles, 85 square miles more or less are closed against grazing and otherwise the whole area is under fire-protection which in 1892 was extremely successful, with almost no expenditure.

We note that there was a slight increase in the number of cases dealt with by the Courts or compounded and which amounted to 361 during the year, against 334 during the former year.

The number of cattle impounded amounted to 4,630 against 5,507 during the previous year. These figures would seem to indicate considerable energy on the part of the Forest protective establishment.

The financial results were also good, they shewed :—

Revenue	...	...	Rs. 25,538
Expenditure	...	...	„ 10,310

Surplus ... Rs. 15,228

Appendix B of the Report has a very useful list of trees and shrubs of the State classified according to the Vernacular and scientific names ; as also a list of fodder-yielding trees and sand binding plants, all of which lists testify to the activity and energy of the Superintendent, whom we congratulate on the excellent results and report he has succeeded in producing.

In conclusion, we note that two more students for the supervision of the State Forests are now under training at the Forest School at Dehra Dún and we venture to suggest that it would be of great advantage to the State pecuniarily and otherwise, to see that the services of properly trained and energetic men are retained, by allotting them a judicious run of promotion, as there is no doubt that the prospects of Forest School trained students in Government employ are much more favorable than those of Native States and this state of affairs naturally causes a good deal of discontent.

V.—SHIKAR AND TRAVEL.

Forest School Sports at Dehra Dun.

The Annual Sports of the Imperial Forest School were held at the old Parade Ground at Dehra, on Saturday afternoon, the 14th instant, and proved a great success. A fine, clear autumn day brought out everyone in Dehra to witness the various competitions which were keenly contested, the greatest interest being shown in them by the English contingent, as well as by the many Gurkhas, Sikhs, Pathans, and Hillmen that were present. Mr. Gamble, the Director of the Forest School, presided over the Sports, assisted by Mr. Smythies, the Deputy Director, Messrs. Gradon and Rogers, the Professors at the School, and Mr. Grenfell, Deputy Conservator, Saharanpur Division: they all worked hard to make the Sports a success, and were well repaid for their untiring efforts by the success of the meeting. The 100 yards was won easily by Langhorne, whose time would have run better had he been more pressed. The competition between Tweedie and Langhorne, in the Hurdle Race, was very keen and close; and in the half mile Pocock and Wood made a splendid race of it in excellent time.

The following are the various events and winners:—

I.—*Flat Race*. Distance 100 yards.

F. J. Langhorne	...	...	...	1
R. L. Pocock	...	...	...	2
S. J. Wood	...	...	...	3

Won easily by a yard. Time—11secs.

II.—*Long Jump*. One prize, open to whole school, and one to native students only.

R. L. Pocock	...	...	...	1
Chinniah	...	...	...	2

The winner jumped 17 feet 5 inches; the second 17 feet $\frac{1}{2}$ inch.

III.—*Hurdle Race*. Distance 120 yards over 10 flights of hurdles.

J. F. Tweedie	...	...	...	1
F. J. Langhorne	...	...	...	2
R. L. Pocock	...	...	...	3

Tweedie and Langhorne jumped each hurdle simultaneously; the former touched the tape only 6 inches ahead. Time—18 $\frac{4}{5}$ secs.

IV.—*Throwing the Cricket Ball.*

T. I. Pocock	...	...	...	1
P. Plunkett	...	...	...	2

In the first attempts Pocock and Plunkett were exactly equal, so they were given three more throws, and Pocock came out the winner with a throw of 95½ yards.

V.—*Flat Race.* Distance 220 yards, for native students only.

Chinnian	...	...	...	1
Rama Row	...	...	...	2
Chintamon Vishwanath	...	...	...	3

Won by a yard, after a good race. Time—27½ secs.

VII.—*High Jump* One prize open to whole School, and one to native students only.

J. F. Tweedie	...	...	...	1
Chinniah	...	...	...	2

Tweedie jumped 4 feet 11 inches, and Chinniah 4 feet 6 inches.

VIII.—*Flat Race.* Distance half mile. Open to whole School.

R. L. Pocock	...	...	...	1
S. A. Wood	...	...	...	2
Rama Row	...	...	...	3

Pocock came up at the end, and won a good race by a yard in 2min. 6½secs., almost a record time.

IX.—*Flat Race.* Distance 100 yards, for School servants.

Ram Kishen	...	...	...	1
Pir Mahomed	...	...	...	2
Amar Singh	...	...	...	3

The greatest interest was shown in this race. Time—11min. ¼secs.

X.—*Flat Race.* Distance 100 yards, for 2nd P. W. O. Gurkha Bandsmen.

Keshab Singh	...	...	...	1
Rattan Singh	...	...	...	2
Dian Singh	...	...	...	3

A close race, won by a foot. Time—11½ secs.

XI.—*Tug-of-War*, Seniors vs. Juniors, 10 each side, 3 tries.

The Juniors won the first try, the Seniors the second; the third try was won by the Seniors rather easily, amidst the greatest excitement. At the termination of the races, the prizes were presented to the winners by Mrs. Smythies.—*Pioneer.*

VI-EXTRACTS, NOTES AND QUERIES.

The Resin of Conifers.

The origin and properties of resin in coniferous timber have recently been investigated by Dr. H. Mayr, and he has succeeded in demonstrating several new and interesting points. The subject is treated rather fully in an article contributed by Dr. Mayr to the *Zeitschrift für Forst und Jagdwesen* for June, and his conclusions, some of which differ from those of previous investigators, are summarised as follows:—

1. Only in an invisible, and thus in the molecular form, in the plasma, can existing resin pass into an intercellular space. Therefore—

2. The cell wall is only permeable for resin so long as it is in process of formation.

3. All resin canal cells which subsequently belong to the permanent tissue of the wood, not resin secreting, epithelial cells, but partly store cells, as other parenchyma cells, partly secondary meristem cells (thin walled), are converted after a series of years into permanent cells; therefore, it follows that a secretion of resin in the canal can only occur during the first year or two of the formation of the canal-carrying annual rings.

4. Finished cell-walls, whether lignified, thickened, or not, cannot be permeated by resin so long as the respective walls are saturated by water, and, as in the living tree, both sap and heartwood are always saturated, so it follows that—

5. All cell-walls of normal wood in the living tree are always free from resin

6. All resin-holding spaces are surrounded by an imperious, continuous cell tissue, and, therefore, are completely isolated. The resin cavities are entirely closed in on all sides, and never open at the exterior in an uninjured tree

7. There is, therefore, no spontaneous exudation of resin towards the surface; every outflow of resin is pathological; where, *primo aspectu*, a spontaneous outflow appears to occur, as on the buds of different conifers, a close investigation shows that it is connected with exudation into an intercellular space, or with the drying-up of the outer layers, thus in the case of the latter a pathological occurrence.

8. All resin canals of the wood stand vertically over one another, and the horizontal always arise from the vertical ; should the place of origin have become lignified with the respective year ring, then the connection between the two forms is effected where the horizontal and vertical canals occasionally cross.

9. With the conversion of sap into heartwood the resin-canals are filled up by tyloses, so that a subsequent flow of resin from the sap to the heartwood, or *vice versa* (as with the economic extraction of resin), is impossible.

10. The resin must be a bye-product in the formation of coniferin, one of the usually occurring substances in the resin-yielding conifers ; the resin does not arise from the coniferin, but simultaneously with it and starch may be considered as the raw material for the formation of both.

11. Neither by normal nor pathological causes (chemical decomposition, or fermentation through fungi) does a conversion of coniferin lignin, or cellulose (the constituents of the cell-walls), into resin occur.

12. Should a gradual diminution of the watery contents of the cell-wall occur through mechanico-pathological causes (wounds, punctures by insects, etc.), the resin partly takes the place of the water, and can, through unwounded and turgescent neighbouring wood, also fill the "lumina" of the cells. Should fresh wood remain in the ground, as, for example, the stumps of felled trees, the resin is gradually forced by the surrounding moisture into the interior of the stump. Under favourable conditions as in stagnant water or bogs, the resin occurs in the rotting wood as resin-hydrate in a crystalline form.—*Gardiners' Chronicle*.

Pice Packets of Quinine.

We have received a copy of the last Cinchona Report of the Government of Bengal with samples of the pice packets of quinine which are now for sale at all Post Offices throughout the Lower Provinces.

The following extract from Dr. G. King's Report shews what has been done.

Sale of Quinine at Post-offices.—The chief event of the year has been the organization of the system by which quinine, made up in doses of five grains, is offered for sale at most of the Post-Offices within the Province of Bengal. Each dose is made up in a neat closed paper envelope, and is sold for one pice. Each packet carries the royal arms as a guarantee of genuineness, together with brief instructions in the vernacular. To encourage the Post-Office officials to push the sale of these

packets, a small commission is allowed, and considerable facility is offered for replenishing of stocks by post-masters; the parcel-rates for transmission, however, bear rather heavily on the scheme, and I trust some means of lightening them may soon be found. When the scheme was suggested last year, it very soon became obvious that one of the first conditions of success would be to find some means of making up the packets by which adulteration and loss from pilfering and careless weighing might be reduced to a minimum. It was therefore decided by Government to make this matter over to the Jail Department. The quinine is therefore made over from the factory to that department in bulk, and by prison labour it is subdivided into pice packets, 1,400 of which go to each avoirdupois pound. The Jail Department distributes these packets to the post-masters and collects the proceeds of the sales at the various Post-Offices. A dose of pure quinine is by this means put within the reach of any person within the province who has a pice to buy it with. Thus at last, after thirty years of effort, has the end been attained which the Government set before itself when the growth of the medical cinchonas was begun in British India. That end was thus expressed in an early Government resolution on the subject:—"To put the only medicine that is of any use in the cure of the commonest and most fatal of Indian diseases within the reach of the poorest." Of the provinces usually supplied with quinine from the Mungpoo Factory, Bengal is the only one into which this pice-packet system has as yet been introduced. It is believed that, should the various provinces under the Government of India adopt the system, large demands will be made on the cinchona plantation, and extended planting operations may have to be undertaken. To meet such, Government have, in addition to the land reserved in the neighbourhood of Mungpoo, a reserve on the Bhootan frontier in Engo Valley, in which ground has not yet been broken.

The Bengal Government express great satisfaction with the arrangement and note that 475lbs of quinine were thus made up into packets for sale during the year. The paper packets are small envelopes of strong paper about $2\frac{1}{4}$ by $1\frac{1}{4}$ inches and each contains 5 grains of sulphate of quinine. The price is so calculated as only just to leave to Government a very small profit on its plantation. This is shewn by the fact that while the *gross* revenue of the year was Rs. 1,17,768 the *net* revenue was only Rs. 3,171. We wish every success to the new venture which ought to be a useful one for Forest Officers, for they can now carry about with them in convenient form, sufficient to meet the many demands for quinine which every forest officer who has had to serve in unhealthy regions is so well accustomed to. We hope that it will not be long before the other Local Governments of the Bengal Presidency follow the lead of Bengal in taking the matter up.

IV.-TIMBER AND PRODUCE TRADE.

Statement of average selling rates of timber and bamboos in Meerut, Cawnpore, Bulandshahr, Pilibhit, Bareilly, and Moradabad for the quarter ending 30th September 1893.

Description.	Timber Scantlings per score.		Bamboos per 100 score.		REMARKS.
	From	To	From	To	
MEERUT.					
Sal 10' Tors (Poles) ...	R. A. P.	R. A. P.	R. A. P.		
Sal & Sain, &c., Karris, 12' x 5" x 4" ...	8 0 0	18 0 0	...	...
Sal bed posts, 7' x 2½" x 2½" ...	25 0 0	40 0 0	...	...
Bamboos of 9' to 10' per 100 score ...	10 0 0	12 0 0	...	...
CAWNPORE.	...	...	40 0 0	100 0 0	
Sal 10' Tors (Poles) ...	5 0 0	6 0 0	...	...
Sal, and Sain &c., Karris, 12' x 5" x 4" ...	25 0 0	100 0 0	...	...
Sal bed posts, 7' x 2½" x 2½" ...	15 0 0	19 0 0	...	...
Bamboos of 9' to 10' per 100 score {	...	...	25 0 0	30 0 0	
			30 0 0	50 0 0	
			50 0 0	100 0 0	
BULANDSHAHR.					
Sal 10' Tors (Poles) ...	...	...	...	..
Sal, and Sain, &c., Karris, 12' x 5" x 4" ...	...	...	...	...
Sal bed posts, 7' x 2½" x 2½" ...	...	...	...	..
Bamboos of 9' to 10' per 100 score ...	...	...	76 0 0	76 0 0	
PILIBHIT.					
Sal 10' Tors (Poles) ...	40 0 0	70 0 0	...	...
Sal and Sain, &c. Karris 12' x 5" x 4" ...	30 0 0	40 0 0	...	...
Sal bed posts 7' x 2½" x 2½' ...	5 0 0	6 4 0	...	..
Bamboos of 9' to 10' per 100 score ...	...	...	60 0 0	100 0 0	
BAREILLY.					
Sal 10' Tors (Poles) ...	5 0 0	10 0 0	...	..
Sal & Sain, &c , Karris, 12' x 5" x 4" {	25 0 0	35 0 0	...	...
	40 0 0	50 0 0	...	...
Sal bed posts 7' x 2½" x 2½" ...	40 0 0	60 0 0	...	...
Bamboos of 9' to 10' per 100 score ...	10 0 0	15 0 0	...	...
MORADABAD.	...	...	50 0 0	137 0 0	
Sal 10' Tors (Poles) ...	20 0 0	25 0 0	...	...
Sal, & Sain, &c., Karris, 12' x 5" x 4" ...	30 0 0	50 0 0	...	...
Sal bed posts 7' x 2½" x 2½" ...	8 0 0	10 0	...	...
Bamboos of 9' to 10' per 100 score ...	...	...	50 0 0	100 0 0	

Churchill and Sim's Circular.

October 5th, 1893.

EAST INDIA TEAK.—The deliveries for the first three quarters of this year amount to 10,118 loads, as compared with 7,656 loads for the nine months of 1892, and with 11,392 loads for the same period of 1891. In the past September the delivery was 1835 loads, and the figures for that month in 1892 and in 1891 were 661 loads and 1551 loads respectively. Prices have remained about stationary, and could well be advanced without danger of checking the growing consumption by excessive cost. The Dock stock is considerably reduced.

ROSEWOOD.—Is difficult of sale, as although stocks are not heavy, the demand is very dull.

SATINWOOD. Logs.—The demand remains very quiet and sales difficult to effect: for *planks* and *boards* there is no enquiry.

EBONY.—The slightly improved demand has now cleared Importer's Stocks, but prices remain low.

PRICE CURRENT.

Indian Teak	per load	£9-10s. to	£15-10s.
Satinwood	„ ton	£5 to	£12
Rosewood	„ „	£5 to	£9
Ebony	„ „	£5 to	£7

MARKET RATES OF PRODUCTS.

(Tropical Agriculturist, October 1893.)

Cardamoms,	per lb.	2s.	to	2s.6d.
Croton seeds	per cwt.	20s.	to	27s.6d.
Citich	„	20s.	to	23s.
Gum Arabic, Madras	„	50s.	to	90s.
Gum Kino	„	100s.	to	140s.
India Rubber, Assam	per lb.	1s.7d.	to	2s.3d.
„ Burma	„	1s.7d.	to	1s.11d.
Myrabolams, Bombay	per cwt	9s.6d.	to	11s.3d.
„	„	7s.9d.	to	9s.
„ „, Godavari	„	7s.6d.	to	8s.
Nux Vomica, good	„	8s.	to	11s.
Orchella, Ceylon	„	22s.	to	28s.
Redwood	per ton	£3.	to	£3-10
Sandalwood, logs	„	£35	to	£55
„ chips	„	£9	to	£30

Cawnpore Price Current.

October 25th, 1893.

		Per Maund.	
		Rs. As.	Rs. As.
Aonla fruits—dried	...	0 12	to 1 0
„ leaves dried and bruised	...	1 12	to 2 0
Babul bark	...	0 9	to 0 10
Bahera	...	1 12	to 2 0
Stick Lac	...	15 0	to 30 0
Myrabolams	...	3 0	to 3 12
Moonj grass	...	1 4	to 1 8
Babul Gum	...	8 0	to 12 0
Mixed Gum	...	6 0	to 8 0

THE INDIAN FORESTER.

Vol. XIX.] December, 1893. [No. 12.

A Tour in Jaunsar.

Thadiar Suspension Bridge.—The Tons is crossed at Thadiar by a suspension bridge, which was built by the Forest Department in 1875 at a cost of Rs. 2,864. It was repaired in 1878-79 at a cost of Rs. 503. The following description of the bridge is taken from the Journal of 1891 :—

“The distance between the uprights is 164 feet, the uprights are 12 feet apart and 15½ feet high. The bridge itself is 7 feet wide. The two cables which support the bridge are 5 inches in girth. The suspensors are 1 inch in circumference ; they are passed through the large cables to prevent them from slipping ; the lower ends of the suspensors are fastened to the cross beams which carry the longitudinal beams, on which the planking rests. Five transverse beams in the middle of the bridge rest on the cables and two others are just under it.

The bridge was originally given a camber of 1 foot to allow for the stretching of the ropes. Railings are placed on either side of the bridge consisting of wooden uprights and wires stretched horizontally. The planks of the roadway are 7 feet long by 6 in. by 2 in. and planks ½ in. thick and 2 feet wide are nailed over these in the centre of the roadway where most of the traffic falls.

Three masonry abutments have been built over the anchorage of the bridge on the left bank to protect it from earth slips.

The cables are fixed to Deodar logs placed horizontally, buried in the ground and kept in position by 2 Sissu logs driven into the ground at an angle of 70 degrees over the Deodar log. The end of the cables are frayed out and nailed on to the Deodar logs.”

The Wet Slide and the Sledge road.—Formerly the sleepers were conveyed to the Tons partly by means of a wet slide, partly by a sledge road. The former was totally destroyed in the great

flood of the 10th August, 1889, and not a vestige now remains. For an account of this flood, see *Indian Forester*, Vol XV, p. 298.

The following description of the wet slide, a model of which may be seen at the Forest School, may be given here for reference, although it is extremely unlikely that any more will be constructed, the sledge road having proved superior in every way :—

“The slide, which is 12,192 feet in length, was constructed during 1876-78 at a cost of Rs. 26,000, whilst up to the end of March, 1885, Rs. 7,988 have been spent on repairs. The gradient varies from 5 to 22 degrees, the best gradient being about 15 degrees, and the total fall is 1,300 feet. It consists of a trough composed of three beams, 12 feet by 13 in. by 5 in., roughly jointed and firmly wedged into block sleepers. These beams, which are of chir, have been found only to last three or four years at the longest, so that the entire slide has had to be reconstructed more than once. It would have been much cheaper in the end to have made it of deodar, as this wood lasts indefinitely in the hills, whilst chir rots in two or three years when exposed to alternations of heat and moisture. The inside measurement of the slide is 13 inches wide by 8 inches high, as it was originally constructed for the sliding of broad-gauge sleepers; for metre-gauge sleepers, a lighter slide would suffice. There are in all eight main bridges varying from 30 to 70 feet in length, as well as several heavy rock-cuttings and retaining walls 20 to 25 feet high. The slide is worked by means of a good flow of water, which is let in from the Bagiar nala by means of troughs situated about a quarter of a mile apart, very little water being required when the gradient is of 22 degrees, but a plentiful supply of water being absolutely necessary when it is less than 18 or 20 degrees. The slide is principally worked during the rains, as there is not sufficient water available at other seasons, except during February, after the melting of the snow. With a good supply of water, a sleeper takes about ten minutes travelling down the slide, and 1,200 sleepers can be slid in one working day of 10 or 12 hours. On arrival at the Thadiar depôt on the banks of the Tons, the sleepers are thrown out of the slide by means of a kind of table provided with a slanting beam against which they strike, and they are then stacked. After the monsoon or during February, the sleepers are slid directly into the Tons, but this cannot be done during the floods. Since its completion to the end of March, 1885, 407,800 sleepers, of which 185,000 were broad-gauge, have been exported by its aid; the saving thus effected has been estimated at Rs. 15,014.”

When the slide was destroyed, it was not considered advisable to construct another owing to the great expense and difficulty in working, and a sledge road similar to the existing one in the Deota forest was made in its place. It has been fully described in Mr. Mc'A. Moir's report of 1891.

The sledge road is 7,960 feet in length and is constructed of two rows of longitudinal beams of chir pine, 10 to 12 feet long $4\frac{1}{2}$ in. by 4 in. and placed 34 in. apart. On to these beams are notched cross pieces 5 feet by 4 in. by 4 in. placed 24 in. to 33 in. apart according to the slope. In these cross pieces, which are made of rejected deodar sleepers, are cut the slots which serve as guides for the sledges. The slots are $\frac{1}{2}$ inch deep, from 6 in. to 7 in. wide, and 30 in. apart from centre to centre. The cross pieces besides being notched, are also fastened by Moru oak trenails.

Where the gradient of the sledge road is less than 6 degrees, the cross pieces are placed 24 inches apart so that the sledge rests on three cross pieces at one time ; where the gradient is more than 6 degrees the cross pieces are placed 30 inches apart and the sledge rests on 2 cross pieces only at the same time. It has been found that the sledge runs more easily on low gradients, when the cross pieces are placed closer to each other.

The sledges do not run easily unless the sledge road is quite dry. In order to decrease the friction, a mixture of soap and mustard oil is applied to the slots of the cross pieces. This is cheaper than ghee, and is nearly as effective ; the mixture is applied where required by a boy who precedes the sledges ; where the gradient is too steep, the progress of the sledge may be stopped by the application of a little sand.

On the inner side of the sledge road is a good drain so as to keep the sledge road as dry as possible. The accumulated water is taken under the sledge road in box drains where necessary. The drier the metalling in which the longitudinal beams are laid the more lasting will they be.

Moru would be more suitable than Deodar on low gradients, as its grain is smoother but it has not yet been used on account of the greater expense in cutting it up. Chir would probably be better than Deodar on the steeper gradients, as its grain is rougher than Deodar, but it is not so lasting.

The sledges are similar to those used on the Deota sledge road ; they consist of two runners made of seasoned Moru Oak placed 28 inches apart, strengthened by two or three wooden struts, and carrying six uprights, and two handles. The runners are 10 feet 8 in. by 5 in. by $1\frac{1}{2}$ in. for B. G. sleepers, and 9 in. by 5 in. by $1\frac{1}{2}$ in. for M. G. sleepers ; and when they are worn down to 2 in. they are re-soled with pieces of Moru oak. One sledge costs about Rs. 10, and carries 20 M. G. or 15 B. G. sleepers. Two men work one sledge and they make 4 to 5 journeys a day from the Chabai depôt to the head of the dry shoot ; they are paid 4 as. per sledge of M. G. sleepers, and 6 as. per sledge of B. G. Sleepers.

We inspected various bridges along the sledge road, and the students took detailed measurements of bridge No. 10, so as to reproduce a drawing to scale.

Bridge No. 1 over the rice fields is 368 ft. long, with 1 spans of variable length, supported on dry rubble stone piers.

Bridge No. 2 is supported by a huge boulder, the top of which has been blasted to receive the roadway.

Bridge No. 9 is 68 ft. long, and 57 ft. high from the bottom of the khud. It consists of one span and is supported by straining beams and struts.

Bridge No. 15 is 154 ft. long, with a gradient of 7 degrees to 8 degrees, and supported on piers and abutments. The piers are 9 feet by $7\frac{1}{2}$ at the base, tapering to 6 ft. by 5 ft. at the top. There are 5 spans of about 28 feet each. To prevent shaking a T or H shaped trestle is erected below the middle of the beams in each span.

The original cost of the Thadiar sledge road was Rs. 4,534, or about Rs. 3,000 per mile. It has been estimated that the cost of carriage of sleepers for four years on men's backs would have been Rs. 39,000, whereas the cost of construction, sledging, repairs, &c., during the same period would be about Rs. 15,500. There is thus a saving of Rs. 23,500, or nearly Rs. 6,000 a year; this clearly shows the advantage of the sledge road over ordinary methods of carriage.

When the sleepers arrive at the end of the sledge road—the Thadiar depôt—they are stacked in heaps of 200, and in October and in November are launched into the Tons by means of the timber shoot. The following description is from the Journal of 1891 :—

“The shoot is 333 feet long. It consists of an open trough laid in an exact straight line, the gradient of the upper 234 feet is 42 degrees, that of the lower 99 feet 26 degrees. It is made of Chir pine throughout. The beams of which the trough is constructed are fixed into wooden tressle supports by means of wedges, the whole being bolted together by iron bolts $\frac{1}{2}$ inch diameter.

The inside measurement of the trough is $11\frac{1}{2}$ inches by 8 inches, the scantlings of which it is made being 12 ft. by 10 inches by 4 in.

The upper portion of the shoot is laid in a trench dug out for it; the lower portion, which is removeable, is supported on strong wooden tressles. These are placed wherever the sides or bottom pieces of the trough are joined. The sides are made to break joint with the bottom piece.

The slide is kept moist, while the sleepers are being launched to decrease the friction and prevent its splintering, water being led from a neighbouring stream to the head of the shoot.

A launching platform has been constructed at the head of the shoot, and the sleepers which are brought down by the sledge road are stacked as near to the head of the shoot as possible.

The sledge road ends on a high bank of boulder and the shoot leads from this into the river Tons."

In one day, about 4,500 sleepers can be launched ; in December 1892, 87,740 sleepers, of which 55,000 were M. G., were launched at a cost of Rs. 243, or nearly $\frac{1}{4}$ a pie per sleeper. Some sleepers of both descriptions were launched in our presence, and they took on an average $7\frac{1}{2}$ seconds to reach the stream ; this is a velocity of 35 miles per hour, allowing 50 feet from the bottom of the shoot to the water.

The Deota deodar forest.—The Deota forest lies in a kind of amphitheatre, bounded by the Lambatach ridge to the west, and the Dhikari dhar to the north and east. The forest forms a portion of the area leased from the Raja of Tehri-Garhwal for Rs. 9,000 per annum, and there are 11 years of the lease yet to run. The area is 4,937 acres, about one-half of which constitutes the deodar zone ; some of it, however, is situated on extremely precipitous ground, and cannot be worked.

The deodar zone in this forest is comprised between 7,000 and 9,000 feet altitude, the forest contains chir in the lower parts, and kharsu oak near the top of the ridge. Spruce, silver and moru are the companions of deodar, with maple, and horse-chestnut near streams. Where some peaks rise above 10,000 feet, as on Rikshin, specimens of *Rhododendron campanulatum* may be found ; it was in flower at the time of our visit, 21st May.

The forest has been divided into 10 blocks with natural boundaries, all drained by the Bagiar stream and its feeders. Fellings began in 1876 in the Partil block to the east of the bungalow, and it took about 12 years to work round westwards through the Temple, Dopta, Jaurasi, Katatach, and Kanga blocks, when fellings began again in the Partil block.

The working plan for the leased forests embraces Deota, Bamsu, Surars, Sahira, Noranu, Naintwar, Datmir, Lambatach, Kotigad, and Chansil, a total area of 45,198 acres ; and the next forest to be worked will be Bamsu where preparations in the way of making a sledge road, and felling trees are now going on.

Deota has now been worked for 18 years and during that period 17,841 green Deodar trees have been felled, besides dry ones which may be estimated at 2,200, making the total 20,000. The outturn of sleepers, estimated in metre-guage, has been 12,00,000.

Natural reproduction has everywhere been excellent and the natural crop of deodar seedlings has been assisted by girdling operations wherever necessary, and supplemented by planting

As a rule, nursery-raised plants have been put out and generally in plots 10 feet by 10 feet, five seedlings in one plot. The plot is entirely cleared of indigofera, grass, &c, and one plant is

put in the middle and one at each corner. This system has succeeded well in the Partil block in plantation No. 5 of 1881, where the following measurements were made in 1888 :—

Six hundred and twelve plants had an average height of 3 feet 9 inches, but they included several younger plants, which had been put in as repairs. The average height of 12 of the tallest plants was 6 feet 4 inches. The success of this plantation is 89 per cent.

A small area planted on this system in 1882 contained 92 plots with five seedlings in each, which had an average height of 2 feet 9 inches, in 1888 :—

Girdling operations have been going on in this forest for some time past ; the object being to give more light to existing seedlings and to induce more seedlings to come up. We noticed a patch of silver fir thus treated near the Deota temple, but the shade cast by the dead stems is still too great for deodar to prosper underneath. In course of time these dead trees have become rotten and are being blown down, and deodar may soon be successfully underplanted. But these gentle, moist slopes, with a westerly or north-westerly aspect, bearing a dense crop of silver fir, are by their nature not suitable for deodar, and it would be a better policy to confine our attention to slopes where we know deodar will grow well, and to girdle all oaks, spruce, fir, &c., shading existing deodar seedlings, and to plant up all the suitable blank spaces and patches of indigofera. This is being gradually done, and all we suggest here is to leave the silver fir area to the last.

Now that felling operations have come to an end in this forest, the principal point to attend to is giving the young deodar more light, as they require it, by girdling, and for this purpose it would probably be well to go round the forest once in five years. The average length of the annual shoots of deodar seedlings here is about eight inches, so in 5 years they will have grown over three feet in height.

Almost all over the areas already worked, the refuse logs and slabs still encumber the ground, seriously interfering with the reproduction ; at any rate on and near the sites of the old sawing pits. It was at one time proposed to utilize this refuse wood in smelting iron, but no iron ore has been found in the neighbourhood. The villagers are allowed to remove free whatever they wish for, but this makes a very small impression on the whole area. Any manufacture which utilizes this refuse material, such as wood-pulp for paper, matches, creosote, &c., would be a great boon. But it is unlikely that any use will be found for this debris, and the only plan is to allow it to rot slowly on the ground, a process which will take many years.



SCLEROTIA FROM WHITE ANTS' NEST.

Sclerotia in a White Ants' nest.

A short while ago, Mr. A. E. Lowrie sent from Chanda, C. P. for determination at the Forest School, a strange black club-shaped fungoid mass which he had found in a white ants' nest. It was first referred to Mr. E. C. Coles who suggested that the growth might be fungoid and drew attention to the remarks upon *Sclerotium stipitium* in the Dictionary of Economic Products: in that work (Vol. VI. ii. 491) Dr. Watt refers to an article in the Journal of the Agri-Horticultural Society to which we have no present access and to one by the late Dr. J. Shortt of Madras in the Journal of the Linnean Society of 1866-67 after reading which we have no doubt of its referring to the same curious growth as that received from Mr. Lowrie.

On a reference to Dr. Geobel's outlines of classification, we find *Sclerotium* defined as "a tuber-like pluri-cellular body, filled with nutrient material, which becomes detached when mature from the mycelium producing it and after remaining dormant for a time puts out shoots which develop into fructification. The most common example of a *Sclerotium* is the ergot of rye (*Claviceps purpurea*).

Dr. Shortt's account of the growth is so interesting that we extract it from the Linnean Society's Journal as follows:—

'Scientific name—*Sclerotium* (Berk. et Curr).

'Indian name.—1. Púttú Manga, from púttú, a white-ant hill, and Manga a mango (fruit); literally white-ant hill mango.

'Syn.—2. Púttú Kái, from púttú, white-ant hill and Kái, fruit,—or, white-ant-hill fruit.

'3. Mail Manga, from mail, dry, like sticks, leaves, etc, and mango, a mango,—or, dry mango.

'I am indebted to the kindness of Daniel Hanbury, Esq., F. L. S., for drawing my attention to the Púttú Manga. I have had some experience in exploring the white-ant hills in the Madras district, while carrying out some experiments (the results of which were to be noticed in an Essay on the destructive effects of the White Ant), and in no instance have I met with the Púttú Manga; nor is the substance, or its name, familiar to the natives of the Carnatic. The fact of its not being found in this part of India may be accounted for by the great dryness of the climate in this locality, and the absence of the moisture and heat so necessary for fungoid growths. On the western coast, where it rains for at least six months in the year, the conditions favourable for the growth of this fungus exist in the burrows or excavations formed by the white ants. The natives state that it is occasionally to be met with in dark crevices, and in the recesses of rocks and caves: my experience does not confirm this latter fact as yet; and the specimens I have now the honour of submitting were all procured from the white-ant hill, or púttú.

'These fungoid growths are only met with in old and deserted ant-hills, and frequently after the insects have become winged: they are found only in the peripheral and more superficial caverns, springing from their roof, occasionally from the floor, never from the cells occupied by the ants themselves. Some grow with long stalks, others are sessile; in those having stalks, they can, in a few, be traced beneath the soil, while the sessile ones seem simply to lie over the soil.

'Messrs Churrey and Hanbury are in unison with Mr. Berkeley in the opinion that the Púttú Manga is of fungoid growth; of this there can be no doubt from the habit and structure as also from the fact that it attains its greatest perfection during or immediately after, the rains; and it is possible that further research during this particular period may tend to discovery of a perfect specimen, with the organs of fructification fully developed. The present specimens were procured in the Coimbatore and Malabar districts, in October 1865, and were removed, some *in situ* attached to the clod of earth, and others loose, from the interior of several white-ant hills, within the caverns of which some were found growing in clusters of six or more, hanging each by a separate stalk, and others simply overlying the floors of the cells, without stalks. Those taken up with the clod of earth soon lost moisture, and crumbled to dust. These, on removal, were not quite so black in colour, and have shrunk considerably in size; and I should say that they are one-third smaller now than when taken out of the white-ant hill.

'They take on a variety of forms, being oval, oblong pyriform, irregularly round, etc. The external rind is black and slightly wrinkled, on cutting into it, the interior is found to be white and pithy, and is compared by the natives to the kernel of a tender cocoa-nut. It is tasteless and inodorous.

'The Malayalum Vythians, who are familiar with the Púttú Manga believe it to be manufactured by the insects themselves, by a kind of accretive process, and that snakes are very fond of it and devour it greedily. Snake-charmers collect the Púttú Manga and take it round for sale, and they then give out that they keep a supply always on hand to feed their snakes with: this assertion I am much inclined to doubt.

'Others say that it is not a vegetable product, but a conglomerated mass of the larvæ of white ants. It is not familiar to the generality of natives, and the educated among them are not aware of its existence; whereas it is well known to the rude villagers, who attribute to it poisonous qualities. The various accounts given of its nature and properties differ so much that one hardly knows what degree of reliance to place on them.

'The Vythians eagerly seek it, and use it as a remedy in cholera, syphilis, and a variety of other diseases. In cholera it is prescribed as a specific, by rubbing it up with a little water and fresh ginger-juice or country arrack; and the dose is repeated after every motion or act of vomiting.

'The natives who assisted in removing the present specimens remarked that they are not full-grown, and that they attain the size of an orange during the monsoons. It is not commonly found in white-ant hills, but is met with in one out of every twenty or thirty on the western coast and Coimbatore district.

'I am indebted to my assistant Mr W. Harvey, for several specimens of the Püttü Manga, as well as for such information on the subject as he could collect for me in the Coimbatore district."

Mr. Lowrie says that in Chanda it is called 'Patha dudhi' and that the natives have an idea that on the formation of a rainbow, the rainbow casts a shadow and this shadow falling on a white ant hill, these fungi are produced. The Sclerotium is used medicinally for women in cases where any difficulty is found during child birth.

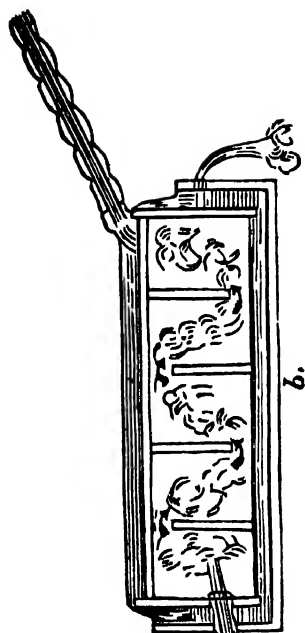
The Camphor Industry in Formosa.

That Camphor is employed against different species of moths of the Tineidæ family in order to prevent them from laying their eggs in woollen clothing and furs and to prevent the damage that follows is known to every child in this country. But whence the Camphor comes, how it is obtained and what its other uses are, must be unknown to many, and so it may perhaps be of interest to our readers to learn from an eye witness, what it is and whence it comes, all the more that it is one of the principal forest products which is of importance to man. *What is Camphor?* Camphor with the chemical formula $C_{10}H_{16}O$ is an etherial oil which is found in the wood of the Camphor tree (*Camphora officinalis*) when treated so as to remove the oxygen. Its specific gravity is 0.98 it melts at 175 degrees C. and sublimes at 204 degrees, is colourless, crystalline, aromatic, rotates in pure water, burns into a strong flame and is soluble in alcohol. Besides the kind we are about to describe which is almost exclusively used in Europe, there is another kind which has long been known in Eastern Asia, the Baros or Borneo Camphor, named after a town Baros on the North-West coast of Sumatra. This kind is obtained from the giant stems of the *Dryobalanops Camphora* especially in Sumatra and Borneo and is much used in those regions in religious and other ceremonies for incense. It comes, however, very little into the trade, because the demand in Eastern Asia is very large in proportion to the production and therefore we may leave it out of account. When we speak of camphor in these pages it must be understood that we refer to the produce of the *Camphora officinalis*. It should be mentioned however that the Baros Camphor fetches eighty times as high a price in the Chinese market as the product obtained from the Camphor tree.

Whence is Camphor obtained? The chief countries in which it is produced are China and Japan. In Japan, it is found chiefly in the hill country on the sea coast southwards from the 30th degree of North Latitude up to the Island of Kinshin and Shikoku where the Camphor tree (*Kusu-no-ki* in Japanese,) adorns the evergreen subtropical forests. In China it is produced in the Central closed region, especially in the middle provinces whence the Camphor Wood chests so much in use in those regions are obtained, but the Camphor itself is hardly produced in sufficient quantity to be able to come into foreign trade. The island of Formosa, on the other hand, which is separated by the straits of Fokien from the continent and lies south of the Tropic of Cancer and measures 38,803 square kilometers, is the chief country of the production and export of Camphor. Formosa is counted politically as a part of the Chinese Province of Fokien which lies opposite it, although the Western side of the island has been practically taken away from the Chinese on account of the long continued fight with the aborigines, which is still going on. The island is divided into halves through one of its lengths by the Ta Chan mountains which run from North to South. The western half inclines to the sea in terrace-like slopes and this gives the name to the chief town Taudan, while on the eastern side, the mountains run done to the sea in steep rocks washed by the waves of the ocean. On the western side, the men of the long pigtail have since they arrived from China, two centuries ago, established themselves and driven back the wild races and the primeval forest. On broad areas the rice fields cultivated and watered with painful care are seen extending themselves and more lately the culture of the tea plant also at the cost of the primeval forest has made such progress that for some time past a large colony of Europeans has established itself in Twatutia, the chief shipping port, for the purposes of tea tasting and purchasing on favourable terms for their houses of trade. Next to the tea 'hong' the Camphor 'hong' plays the chief part in Twatutia, shewing the value of the export trade in these two products. To this place comes the camphor down from the mountains; partly by water on the Tawsui river; partly by a road built a few years ago by English Engineers for the Chinese Government; and partly on the broad shoulders of sturdy Chinese called 'coolies.'

In order to reach the place of production of the Camphor, one has first to travel by road for many miles into the interior, then partly on foot by narrow foot paths, partly in sedan chairs borne by coolies in country fashion up to the higher and steeper mountain passes, where the cultivation of the soil has to be fought out with greater difficulties and where the aborigines of the island, who belong to the Malay race, have withstood till now under the shade of the primeval forest the further advance of the Mongolians.

The Camphor Tree (*Camphora officinalis* or *Laurus Camphora*). Here in the luxuriant verdure of the countless varieties of the vegetation of a tropical and subtropical forest, we can recognize



b.

Fig. 1.



Fig. 2.

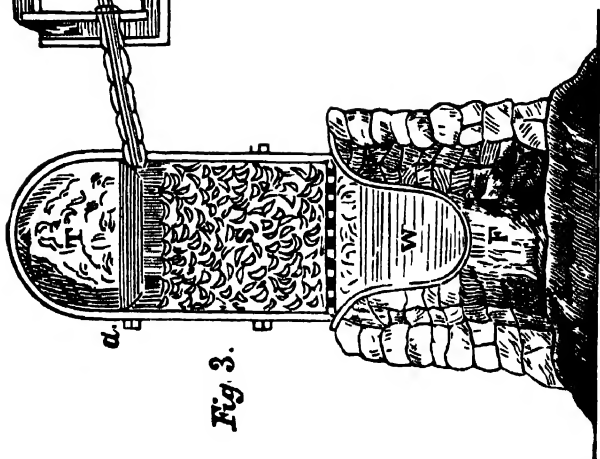


Fig. 3.

among the many varieties of ferns, among the palms and tall bamboos, among the different kinds of fir and the thousand other known and unknown representatives of the flora of the country, the giants to whom those lines are devoted,—the Camphor trees. The tree belongs to the family of the Lauraceæ and its home is on the Eastern monsoon region where it is found from the 9th to the 30th degree of north latitude, on the East coast of Asia and its neighbouring islands. It reaches enormous dimensions and is considered in Japan as the king of broad leaved trees. Thus Professor Bälz of Tokio records a camphor tree having $72\frac{1}{2}$ ft. in circumference at breast height and being 2,000 years old. Rein, too, gives in his excellent work on Japan, the astonishing dimensions of this tree as reaching $11\frac{1}{2}$ metres in circumference and 50 metres in height.

The Camphor tree resembles our oak in its whole habit. It has the same mighty stem, with often a rough bole, the knotty branches and the irregular crown which besides in consequence of the thick foliage with dark green leathery leaves is almost impossible to see through. The interior of Formosa is still to be considered as among the richest in proportion to other lands. But in the continually growing trade in Camphor, and the wasteful kind and method of its exploitation, the stock accumulated in many centuries will soon be exhausted if nature does not in her tropical exuberance of vegetation produce sufficient regrowth, or the Chinese following the good example of the Japanese begin to start a proper system of forestry.

The exploitation of the Camphor. Here in the centre of the island, the camphor trees are felled in the management of the primeval forest, when they have 3 to 4 feet in diameter. The upper part of the bole, which gives but little camphor, generally remains lying worthless if it falls in a place which is not favourable for being taken to market, partly for consumption on the island itself, partly for export. The rootstock, however, and especially the roots which contain much camphor are cut with specially formed axes (fig. 1) into pieces about two centimetres long, called 'chips' (fig. 2). These are then placed in one of the nearest camphor stills which are erected in the forest itself and set up in various places in the island, (fig. 3) with hot water boilers through which the camphor is extracted from the wood and precipitated in converted earthen pots fig. 3a). In Japan, the camphor stills work more cleanly and the steam is led sideways through a hollow bamboo into a condensing apparatus, over which water is led constantly in order to cool it and which at the same time affords a good means of confinement against the escape of steam. But in Formosa also, stills are worked for which the Chinese Government demands monthly a licence tax of one Mexican dollar (3s) and these make a better distilling apparatus and economize material.

After the camphor has been precipitated on the walls of the pot it is scraped off and brought in leaf baskets to the 'hông' of the camphor merchant. In this condition it still contains much oil of camphor and thus it comes into export, and possibly in order to economize weight and volume, means has lately been sought for separating the oil from the camphor in presses brought from Europe. After this procedure has been gone through in the 'hông,' the camphor is usually packed in lead-lined chests and goes on its journey to different quarters. This raw camphor is sublimed again in Europe and America, and comes out, then in the form of shell shaped colourless transparent pieces of a granular crystalline structure suitable for the retail trade.

What is Camphor used for? The best known use of camphor is still, as already explained, that of the protection of furs. For this reason also, in Eastern Asia, where furs are much worn, chests made of camphor tree wood are much in request. It is also much used in medicine for many purposes, and the fabrication of camphor oil, camphor spirits and camphor wine, absorbs a notable percentage of the quantity imported. In industries, it serves for the preparation of blasting gelatine and celluloid which latter nowadays is employed so much for making billiard balls, stick tops, combs, knife handles, &c., and for the imitation of ebony and malachite, as well as for the various kinds of smokeless powder.

Export of Camphor from Japan and China.—The following statistics, show the great importance of the camphor trade in Japan and China (Formosa), of late years. They are chiefly obtained from the 'Résumé Statistique de l'Empire du Japon,' and the 'Statistical series of the imperial maritime customs in China.'

Export of unrefined Camphor from Japan.

1886,	32,696	cwt.	valued at	£	193,957
1887,	36,874	"	"	"	236,294
1888,	27,338	"	"	"	212,738
1889,	29,825	"	"	"	290,796
1890,	26,782	"	"	"	403,786

Export of raw Camphor from Formosa.

1889,	2,521	"	"	"	11,897
1890,	4,389	"	"	"	34,989
1891,	11,192	"	"	"	89,499
1892,	10,486	"	"	"	83,395

Import of Camphor into Germany.

1886,	cwt.	3,989
1887,	"	6,468
1888,	"	7,943
1889,	"	7,070
1890,	"	7,298
1891,	"	11,444

while the value of 100 kilogrammes (2·4 cwt) was £14 in 1890 and £15 in 1891. So that of late years the value alone of the raw camphor imported from Germany reached £156,660, a sum which to take a forest comparison, surpasses half the revenue of the Wurtemberg state forests.

(Translated from an Article in the '*Forstlich Naturwissenschaftliche Zeitschrift*' for August 1893, by B. R. Freiherr von Herman).

II—CORRESPONDENCE.

Tea-box Woods.

SIR,

Referring to Mr. Thurston's note on Indian Woods for tea-boxes, published in an appendix to the '*Indian Forester*' of November 1892, and to a letter on the same subject written by Mr. Hope, which appeared in your issue of last, I should like to put forward the following remarks upon the subject in question:—

My experience has been gathered wholly from the Darjeeling Tea District, and though writing this letter from the Chittagong Hill Tracts, I am certain that the views put forward by me will have the concurrence of some, at least, of the leading planters of that district.

Mr. Hope in his letter assumes that Semul wood (*Bombax Malabaricum*,) is more or less a kind well suited for tea-box purposes; as far as the Darjeeling district is concerned, that is certainly not the case, for the Semul wood is looked upon as one of the worst possible to be so utilized, unless the planks have been cut from very old and large trees; it having the reputation of getting worm eaten before its arrival at the European markets; and I have been told that brokers in Calcutta would give a higher rate for teas packed in Toon (*Cedrela Toona*,) boxes than they would for those packed in Semul.

I will not attempt to answer Mr. Hope's question, as most of them refer to the Dehra Dun district; but the following will help to explain the reason why the so called 'Japan boxes' or 'Shooks' are preferred to those made from Indian timber.—

When a manager wishes to cut his tea boxes from forest trees, he arranges, as a rule, to have it done by contract, which is generally given to one of his sirdars. This sirdar to execute his contract, has to call on outside coolies to help him : now to procure these he has to make heavy advances, which the manager has to give to the sirdar from the Tea-concern.

It may happen that the outside cutters and sawyers get ill, or discontented, and run away with these same advances thus creating a loss to the concern, for they are too cunning to allow themselves to be caught and prosecuted. Even if such be not the case, one cannot depend upon the sirdars to finish the contract within the limited time ; then imagine the anxiety of the manager for he would be in a 'fix' (to use an Americanism), if his box planking were not in before the rains broke.

Further, when the planking is cut up, it usually takes the shape of 10 in. by 1 in. planks; these are stacked in the factory, and so as not to have too much room occupied by empty boxes, these planks are cut up and fashioned as they are wanted. Now compare the difference in the room wanted by the carpenters when cutting up and putting together boxes made from such planks, and that required to put together boxes whose tops, bottoms, and sides, have already been fashioned.

No wonder then that planters are willing to pay an anna or two extra for the 'shooks' ! for he only has to give an order, and his responsibility and risk is reduced to a minimum.

Now my opinion is ; that the forest Department should arrange to have planks cut into shapes suitable for tea-box-making : that these shapes should be procurable from any central dépôt.

It would be useless to try any experiment of this kind without the assistance and co-operation of the planters concerned ; to procure this, the various Tea Associations should be addressed asking them for their co-operation, and at the same time request, ing them to name any local trees that may be fit and suitable for box planking and which they would be prepared to try, a this Department could manage to cut and shape the wood at if fairly cheap and profitable rate.

W. H. L.

Legal duty of Assistance and Information.

DEAR SIR,

I do not know whether remarks on a legal question appearing in your September number, and sent out from England so as to reach you (I suppose) in November, will be of much use ; but in case it may be, I will proceed to note that Sec. 78 of the Indian Forest

Acts, unquestionably is a *law* in every sense of the term, and it imposes on the particular class of persons therein enumerated the *legal duty* of giving information as to (fulfilled) commission of any forest offence, or the intention to commit one. Forest Offence is defined to mean an offence punishable under the Act or Rules made pursuant to it.

There is no special penalty attached to Sec. 78, because, when a person becomes *legally bound* (by any law) and neglects the obligation, he becomes liable to the provisions of the Indian Penal Code. This Act provides several sections on the subject, viz. 176 and 177, 202 and 203, and 187. These are general in terms and occur in chapters dealing with offences against the authority of (all classes of) "Public Servants" (vide definition Sec. 21,) and against Evidence and Public Justice. It passes my comprehension to understand how any Court or other person could doubt that a person infringing Sec. 78 of the F. Act. (when clearly brought home to him ;— this may be difficult to prove but it is a question of fact, that he was called on to assist and refused, or that he possessed the information and did not give it) is liable under one or other of the above sections, I. P. C. It is because he is obviously so liable, that no penalty was added in the Forest Act.

It will be observed that Section 187 (the only one quoted by your correspondent) applies in case it is a matter of omission to *assist*, under the 1st portion of the Section if it refers to general assistance, where demandable by law ; under the 2nd portion, if the assistance was to *prevent* an offence (*i. e.* any offence whatever by definition, Sec. 40, ch. 2).

If it is an omission to *inform*, then the 1st part of Sec. 176 clearly applies in *all* cases ; and the second part in some. The *duty* as defined in the Forest Act is to report *all forest offences*; and that of course comes within the obligation to furnish 'any information' the breach of which Sec. 176 (1st part) punishes. If it was intended to apply the 2nd part and its larger penalty, it must further be shown that the information omitted related not only to a forest offence but to one of the graver kind which carries a penalty of not less than six months prison (with or without force), for the further condition is required by the terms of Sec. 176 (part 2nd,) the 'offence' there alluded to being (by definition Sec. 40 clause 2,) one of the grave ones described. Practically, the Forest Officer would not want to complain of neglect to inform about the intention to commit a forest offence unless it was of a serious kind ; if (under special circumstances) he did, he would have to proceed under the 1st part of Sec. 176; because that includes *any* legally required information on any subject.

I may remark that Sec. 276 is followed by 177 the first relating to *omitting* information, the second to giving *false* information.

It is also worth while to add, that the Code has given another pair of Sections 202, 203, (distinguished by the same feature) ; and the reader will at first be inclined to suppose, that Secs. 202 and 203 are mere repetitions of Secs. 176 and 177, the difference is not very great, but the pair 176 and 177 refer to *intention* to commit, and the other to offences actually *committed*. They might have been clubbed together but then Sec. 176 *also* includes *any* information (not necessarily connected with offences—such as news that a forest is on fire by accident,) and so it was thought that it would conduce to clearness to have a separation.

An offence against Secs. 187 and 176, or 202 I. P. C. could not be compounded under Sec. 67 of the Forest Act ; an offence solely punishable under the General Law (I. P. C.) is not within its meaning. As these sort of matters are always easier to understand and to remember by aid of a sort analytical diagram, let me conclude by giving you one.

(A) Omission to ASSIST (when bound by law e.g. sec. 78, I. F. A. or other law)	{ (a) any assistance demandable by law I. P. C. sec. 187 1st portion. (b) special assistance to prevent an offence, which means (by defini- tion) any offence whatever. 187 2nd portion.
(B) Omission to INFORM. Do. Do.	{ (1) regarding any subject required by law—may be about offences or otherwise. 176 (1st portion.) (2) regarding an offence intended (i.e.) an offence under I. P. Code or under special law if of the graver class (this by definition.) 176 2nd portion. (3) regarding an offence actually committed (i.e. offence as in (2). 202

[In either case if instead of *omission*, it is giving *false* information, the Secs. become 177 and 203 respectively ; and in the case of 203 (only) the meaning of 'offence', is enlarged to include any offence whatever.]

B. H. B. P.

A Tour in Jaunsar.

DEAR MR. EDITOR,

I wish to offer a few remarks on the notes which appear under this title in the July and August numbers of the *Indian Forester*.

In treating of deodar plantations the writer fails to notice the very important question of the age of the transplants used. I hope he will supply this omission some time, for the generally unsatisfactory results obtained in the various attempts made in Jaunsar to propagate deodar by planting, have been due in my opinion, to the transplants having been put out too young. In my working-plan for the Mundali forests (I speak from memory), I have shown how much greater success was obtained with deodar planting in the Ranikhet and Naini Tal Forests, simply because large transplants were used. The deodar seedling, even when put out at the age of 5-6 years, displays great vitality and recovers easily and rapidly from the mutilation of its roots inevitable in all transplanting operations.

But we need not go outside of Jaunsar to prove the advantage that large deodar transplants have over small ones. Indeed we need not go further than the plantation in the Lurli Block just below the hospital, which is described in the notes. An examination of this plantation will show how much larger and more vigorous the seedlings are which were put out in filling up vacancies, but which are nevertheless of the same age as those surviving from those originally planted out. I pointed out this to the Divisional Officer when I conducted the Forest School tour in 1890.

He seemed convinced, and at any rate, if I remember correctly, expressed his intention, in a Report which I have recently read, of in future using only transplants of a certain age. I consequently felt no little surprise at reading on page 242 of the *Indian Forester* that plants only two years old are considered as "ready to be put out into the forest."

When one compares in Jaunsar the size and vigour of the seedlings left standing in the nurseries with those of their companions put out into the forest, one cannot but be struck with the difference. Such should not, however, be the case, seeing the marvellous recuperative powers of deodar transplants, and it becomes at once clear that, as a general rule in Jaunsar, the transplants have been used far too young.

I shall be glad to be proved in the wrong, but the conclusion I have come to is based on close observation and special attention given to the subject during a period of ten years.

To settle the question once for all to the satisfaction of all parties, the School Circle Officers should establish a series of experiments, employing transplants of various ages under, in other respects, similar or identical conditions. The results of such experiments will not of course begin to show themselves

for the next ten years at least ; but in the meantime our colleagues in the Punjab and in the Central Circle of the North-Western Provinces will no doubt give us, in the pages of the Journal, the benefit of their experience in connection with deodar planting in their respective charges, and the Forest School has unrivalled opportunities of studying the question in the numerous small plantations in Jaunsar.

What I have said in respect of the deodar is true also in respect of *Pinus longifolia*, and will in all probability be found to hold true in the case of the blue pine as well. The difference of results, in *Pinus longifolia* plantations, when small seedlings are used and when large ones, from 18 to 30 inches high, are employed is strikingly in favour of the latter, not only as regards the percentage of success, but also on the score of vigour and rapidity of growth. And as for the blue pine all attempts made to propagate it in Jaunsar have been admitted failures, the reason, in my opinion, being that such attempts have been limited either to direct sowings or to planting out small seedlings, which in the very nature of things possess too little vitality to survive in any appreciable numbers.

Another point in the paper I would notice is the incredible statement contained in the following sentence regarding the reason for the appearance of self-sown blue pine seedlings on slopes on which no parent trees are known to exist :—"It is possible that the seed may have been blown across the valley from the heights of Matkangra, a distance of two or three miles in a straight line" ! The note of interjection is mine. It is curious how this impossible wind theory suddenly found admittance into printed reports above the signature of a very high placed officer about a score of years ago and has enjoyed currency ever since. A tornado would be mere child's play to the wind that could blow blue pine seeds, winged though they are, three miles across a valley several thousands of feet deep. The agency of birds is quite sufficient to account for the appearance of the seedlings in question. I have seen the Jungle crow (*Corvus macrorhynchus*) in flocks of over thirty birds picking out seeds from spruce fir cones, and on being disturbed, making off with the cones in their bills and flying across to the opposite hill side. One one occasion I happened to be breakfasting off cold chicken on a spur overlooking a broad valley. A crow of this species watched me eating, and as he picked up each bone he flew off with it to the opposite hill-side nearly a mile off where he finished it. He returned for his next bone in less than six minutes. I quote the above instances to show how this peculiar habit of a single species of bird is sufficient to explain the occurrence of young blue pines on slopes bearing no parent trees on the heights above. But besides the crow, we have the various pheasants and the Himalayan nutcracker (*Nucifraga hemispila*), and no doubt other birds also, to account for the phenomenon

E. E. FERNANDEZ.

III.—OFFICIAL PAPERS & INTELLIGENCE.

The new draft Rules regarding Settlement and the positions of Revenue and Forest Officers.

The following Draft rules regarding the settlement and management of land taken up under the India Forest Act, and regulating the position of Revenue and Forest Officers in regard to the administration of such land, have been circulated by the Government of India for opinion and as they contain much of considerable importance to Forest Officers, we consider it right to reproduce them in our pages.

PART A.—PREAMBLE.

1. It is important that all lands in which Government hold or claim a complete or material proprietary interest, which have not been formally demarcated and settled, and which are considered suitable for timber forest, fuel and fodder plantations, grazing reserves and the like, should be demarcated, and the rights therein definitely settled with as little delay as possible.

2. The settlement of such lands need not be immediately followed by the constitution of timber forest, plantations or grazing reserves. They can, until required for these objects, be utilized for any purpose. What is required is that they should be recorded and settled as Government property, available for any of the objects above described.

3. Although it is not contemplated by the Forest Act that lands primarily destined for agricultural purposes should be brought under the provisions of that Act, there is nothing to prevent lands settled under the Act being utilized for agriculture, whether they remain under the provisions of the Act or are disforested.

4. In the Act there is no definition of 'forest.' As in Scotland, the term may be applied to land absolutely destitute of trees. Accordingly lands taken up under Chapter* II of the Indian Forest Act, VII of 1878, and technically constituted "reserved forest," are not required under that or any other law to be planted with trees, or to be maintained for the growth trees.

5. As lands taken up under the Forest Act may be utilized for cultivation, grazing, or any other purpose, so they may be placed under any management, whether (as in the case of cultivated forest

* Chapter II of the Burma Forest Act, 1881.
Chapter II of the Upper Burma Forest Regulation, 1887.

Chapter II of the Madras Forest Act, 1882.
Chapter II of the Assam Forest Regulation, 1891.

Chapter II of the Berar Forest Law, 1886.
Chapter II of the British Baluchistan Forest Regulation, 1890.

Section 3 et seq. of the Ajmere Forest Regulation, 1874.

land or grazing areas in some provinces) that of Revenue officers, or (as in the case of certain horse-runs, grass-farms, &c.) that of the Military Department, or (as in the case of forests proper, or of areas in which grazing or fuel and fodder reserves require special management and protection) that of the Forest Department.

PART B.—GENERAL RULES.

I.—All waste land considered suitable for timber forest, fuel and fodder plantations, grazing reserves and the like (1) which is the property of Government, or (2) over which the Government has proprietary rights and wherein the rights of the Government and of persons other than the Government have not been precisely determined and recorded, shall be taken up, dealt with, and settled under the provisions of Chapter II of the Indian Forest Act.

II.—Lands so settled will be classed under one or more of the following heads :—

- (i) Agricultural lands.
- (ii) Forests proper.
- (iii) Fuel and fodder reserves.
- (iv) Pasture lands.
- (v) Any combination of (ii), (iii), and (iv).
- (vi) Special purposes (*e.g.*, horse-runs).

III.—The Collector shall after consulting the District Forest Officer and the Conservator of Forests, submit for the orders of the Local Government, through the usual channel, proposals indicating for which of the purposes enumerated in Rule II it is intended to maintain the areas, when settled, whether in whole or in part.

IV.—The Local Government will when issuing orders on the proposals of the Collector, or as soon as possible thereafter, determine the agency under which each classified area shall be administered ; but it may from time to time change such agency.

V.—The Collector shall be responsible that all Government lands within his district are brought under settlement.

VI.—He shall submit annually to the Land Revenue authorities by whom he is controlled, for the orders of the Local Government, a schedule of unsettled lands with proposals for their settlement.

VII.—Lands brought under the Act and classed under Rule II (i) may, when required for agricultural purposes, either be retained under the operation of the Forest law or be disforested.

VIII.—If in the opinion of the Local Government they should be excluded, the previous sanction of the Governor General in Council must, under section* 26 of the Indian Forest Act, be obtained to their exclusion.

* Section 29 of the Burma Forest Act, 1881.
Section 27 of the Upper Burma Forest Regulation, 1887.

Section 24 of the Madras Forest Act, 1882.
Section 28 of the Assam Forest Regulation, 1891.

Section 11 of the Berar Forest Law, 1896.
Section 10 of the British Baluchistan Forest Regulation, 1890.

IX.—The Collector shall be responsible that the records of each settlement in his district are complete, and that they contain the following entries ;—

(a) A correct boundary register.

† Section 13 of the Burma Forest Act, 1881.
 Section 11 of the Upper Burma Forest Regulation, 1887.
 Section 11 of the Madras Forest Act, 1882.
 Section 11 of the Assam Forest Regulation, 1891.
 Section 10 of the Berar Forest Law, 1886.
 Section 9 of the British Baluchistan Regulation, 1890.
 Section 4 of the Ajmere Forest Regulation, 1874.

(c) Rights granted by the

‡ Section 22 of the Burma Forest Act, 1881.
 Section 20 of the Upper Burma Forest Regulation, 1887.
 Section 18 of the Madras Forest Act, 1882.
 Section 21 of the Assam Forest Regulation, 1898.
 Section 6 of the Berar Forest Law, 1886.
 Section 5 of the British Baluchistan Forest Regulation, 1890.

(d) Temporary concessions,
 * Section 27 (a) of the Burma Forest Act, 1881.
 Section 25 (b) of the Upper Burma Forest Regulation, 1887.
 Section 21 of the Madras Forest Act, 1882.
 Section 26 (d) of the Assam Forest Regulation, 1891.
 Section 10 (a) of the Berar Forest Law, 1886.
 Section 9 (a) of the British Baluchistan Forest Regulation, 1890.

(b) Private rights admitted and settled under section 13 † *et seq.* of the Indian Forest Act, with such remarks regarding their limitation, commutation and extinction as the case may require.

Local Government under section 22‡ of the Indian Forest Act, with the necessary particulars as regards duration, limitation, and other conditions.

changeable or terminable at the will of the Local Government, granted under rules made by Government under section 25* of the Indian Forest Act.

(e) Standing orders issued under section 25 of the Indian Forest Act for the permission of certain specific acts.

X.—The Divisional Forest Officer may at any stage of the operations submit to the Collector any proposal or suggestion relating to the classification of land or to settlements.

XI.—The Conservator may submit to the Local Government (through the proper channel) a report on the settlements in his circle or in any particular district.

XII.—In determining the agency under Rule IV, consideration should be given to the fact that the forest administration forms an integral part of the Revenue system of the country and that the forest staff provides the most convenient agency, under the control of the Revenue authorities, for the executive management not only of forests proper and of fodder and fuel reserves, but also of all Government lands in which these classes are intermixed with pasture lands, as well as, in many classes, of pasture lands which include no forests proper.

XIII.—Every settled area must be managed in accordance with a systematic and pre-considered working-plan, deviations from which should take place only under proper sanction.

XIV.—The scheme of management of each settled area should, so far as legal and political conditions permit, be based on all facts and influences upon which the most rational and profitable treatment depends. The collection, however, of the necessary data takes time, and all working-plans will therefore at present be divided into—

(a) *Regular working plans*—based on an efficient and methodical enquiry and consideration of all existing facts which may materially influence the manner of treatment.

(b) *Provisional working plans*—based on such data as may be available or can be collected without delay.

XV.—The regular working-plans must aim at a permanent treatment of the settled areas, and will be framed on a general scheme, which must, otherwise than in exceptional circumstances and for exceptional reasons, be permanently maintained; provided that detailed prescriptions for the intermediate treatment, necessary to bring the land into the ultimate and permanent condition aimed at, may be made for such limited terms of years as may be considered necessary.

Provisional working-plans (which may extend for one or more years) are only intended to be used as 'make-shifts' until sufficient data have been collected for the preparation of regular working-plans.

XVI.—The Collector will, with reference to Rule II, be responsible for the preparation of working-plans in the case both of lands of class (i) and of those lands in classes (ii), (iii), (iv), and (v) which are not under the executive management of the Forest Department. In the case of lands of class (vi), the appropriate special Department is responsible.

PART C.—SPECIAL RULES RELATING TO LANDS UNDER THE EXECUTIVE MANAGEMENT OF THE FOREST DEPARTMENT.

XVII.—The following rules are prescribed for the preparation of Working-plans :—

(a) The Divisional Forest Officer shall submit to the Collector, not later than six months before the beginning of the forest year, a report containing a list of all areas under his control. He shall in his report—

(1) as regards those areas for which regular working-plans are in operation, shortly state what works will be carried out under the prescriptions of such plans in the year following ;

(2) as regards areas managed according to provisional working-plans, mention what works are provided for the ensuing year ;

- (3) *for areas for which no regular or provisional working-plans are provided for the ensuing year*, make proposals, after due consideration of the possibility and the requirements of each area, for provisional working-plans, which shall contain his recommendations as regards fire-protection, closure against or regulation of grazing, and works of silviculture, forest improvement and the like, and the term for which (*i.e.*, whether for one or more years) it shall be in operation.
- (b) The Divisional Forest Officer should, either when he forwards the report required by clause (a) of this Rule, or at any other convenient opportunity, submit from time to time, *in respect to any areas for which no regular working-plans exist*, provisional proposals for the preparation of regular working-plans, stating whether he is in a position to compile the plans himself, and noting the assistance he may require for this purpose, or recommending that the work should be undertaken by special agency.
- (c) The Collector shall, on receipt of the report prescribed under clause (a) above, forward without delay to the Conservator of Forests sections (1) and (2) thereof, indicating the works to be undertaken during the following year under the provisions of existing working-plans. The Collector may retain section (3) for consideration of the provisional working-plan with special reference to the satisfaction of rightholders in regard to forest-produce; to any proposed closure against grazing; to the withdrawal of privileges which Government may have conceded; or to local wants in forest-produce generally. And he may, if he considers such plan open to objection in any of these particulars, return the same with his comments to the officer from whom it was received, for alteration in accordance with any directions he may make. In the event of such directions being considered by the Divisional Forest Officer to be beyond the 'possibility' of the forest in question, *i.e.*, to be incompatible with its maintenance and improvement, the case will be referred to the Conservator through the Collector. If the Conservator and the Collector, after such consultation as may be necessary, are unable to agree as to the treatment of the forest, the case will be referred to higher authority, and if necessary to Government.
- (d) Provisional plans approved by the Collector shall be forwarded, within one month of their receipt, to the Conservator, who may, if he concurs, sanction them. In cases where the Collector and the Conservator

differ in regard to the applicability of any provision in a provisional working-plan, and when the difference cannot be removed by mutual references, the question shall be submitted to the higher Revenue authority, who shall endeavour to settle it with the Conservator, and, if unable to do so, lay it before Government for orders, informing the Conservator that he has done so.

- (e) The Collector, on receiving provisional proposals for the preparation of working-plans under clause (b) of this rule, shall submit them with his comments to the higher Revenue authority, who will forward them to the Conservator for further action.
- (f) Except as provided in Rule XVI, the Conservator is responsible that regular working-plans are prepared as soon as possible for all reserved forests in his Circle. He may either take the initiative in drawing up the plans, or may take action on the provisional proposals submitted by the divisional officers as above. In either case he will be responsible for the soundness, on all technical points, of the provisions of the working-plans, and for the manner in which they are framed.
- (g) Every working-plan shall, after it has been framed or scrutinized by the Conservator, be finally examined by the Collector with special reference to the satisfaction of right-holders in regard to forest produce; to any proposed closure against grazing; to the withdrawal of privileges which Government may have conceded; and to the requirements of the adjacent population generally. It shall then be submitted, through the superior Revenue authority, to the Local Government for sanction. In cases where the Collector and the Conservator differ in regard to the practicability of any provision in a working-plan, and where consultation or mutual references fail to settle the question, the views of both officers shall be submitted to Government with the opinion of the superior Revenue authority.
- (h) In the Bengal Presidency, all regular working-plans are submitted to the Local Government through the Inspector-General of Forests, who scrutinizes them and lays them before Government with his opinion.

Deviations from Working Plans.

XVIII.—For the regulation of unavoidable or desirable deviations from the prescriptions of working-plans, the following rules are prescribed :—

- (a) The Divisional Forest Officer is responsible that proposals for any unavoidable or suggested deviations from sanctioned working-plans are, as soon as feasible, reported to the Collector, so that the necessary sanction thereto may without delay be given by him, or may be obtained from competent authority. Particulars of such sanction shall be entered in the Control books prescribed under the Forest Code.
- (b) The Collector may sanction, on his own authority, any deviations from working-plans, regular or provisional, which do not involve either utilization* of forest produce in excess of prescription, or diminution in the extent of forest protected from fire, or of forest closed to grazing or browsing. Such deviations require the sanction of the Local Government. He shall report to the Conservator, for information and note, any sanction which he has given under this rule.
- (c) The Collector shall forward any such proposals, which it is not within his own power to sanction, direct to the Conservator if the interests of the people are not materially affected, and through the superior Revenue authority to the Conservator if they are so affected.
- (d) In cases where the Divisional Forest Officer has not, on his own motion, submitted proposals for necessary or desirable deviations, the Collector may, if he thinks fit, direct him to submit such proposals.
- (e) The Conservator shall send direct to Government, for sanction, all proposals for deviations from *regular* working-plans received under clause (c) of this Rule in respect to which he agrees with the Revenue authorities. If he differs, he shall forward them through the Revenue authorities to the Local Government.
- (f) The Conservator shall return, with his opinion, to the Collector all proposals for deviations from provisional working-plans received direct from the Collector under clause (c) of this rule. If he agrees with the Collector, the proposed deviation may be carried out. If he does not agree, the Collector will forward the case to the superior Revenue authority, who, if necessary, will submit it for the orders of Government.

* Utilization of produce in any one year over and above the prescription for that year shall not be considered excess utilization if it is covered by unutilized balances from previous years.

- (g) The Conservator shall forward to the Collector all proposals for deviations from provisional working-plans received through the superior Revenue authority under clause (c). If the Conservator agrees in the proposals, the deviation may be carried out. If he does not agree, the Collector will resubmit the case to the superior authority, who will, if necessary, submit it for the orders of Government.
- (h) Particulars of all sanctioned deviations shall be entered in the Control books both of the Divisional Officer and of the Conservator.

Protection. XIX.—To secure the protection of forests, the following rules are prescribed :—

- (a) The Conservator of Forests is charged with the general control of the protection of the forests in his circle against damage by man or beast. He is required to suggest such measures as may be necessary to make protection efficient.
- (b) The Collector, or other Revenue officer in independent charge of a sub-division, shall be responsible that the measures ordered for the protection of the forests in his district or sub-division are efficiently carried out, and that the subordinate Revenue and police officers of all grades render active assistance. He shall also control the working of the punitive sections of the forest law, and prevent any further interference with the people than is necessary for efficient protection.
- (c) The Divisional Forest Officer, under the orders of the Collector, will be in charge of all works necessary to ensure the efficient protection of the forests.
- (d) The Range-Officer is primarily responsible for the protection of the forests in his range, but is also bound to render general assistance in the protection of any forest.
- (e) The Forest Officer in charge of one or more beats is primarily responsible for the protection of forests in his charge, but has also to render general assistance in the protection of any forest.

Technical management. XX.—For the technical management of forests, the following rules are prescribed :—

- (a) The Conservator of Forests shall control all practical 'working', including the disposal of forest-produce within the prescriptions of a working-plan. For this purpose he will examine the control forms. If he discovers by these means or during his tours of inspection, or from the Divisional Forest Officer's journal, any deviation for which sanction has not been obtained, he shall bring the matter to the notice of the Collector for necessary action.

- (b) The Collector shall not, as a rule, interfere in the technical management of the State forests in his district, but shall nevertheless exercise a general supervision, and may address the Conservator on any matters regarding, and suggest any change in, the technical management.
- (c) The Divisional Forest Officer is responsible that all works of silviculture, forest improvement, exploitation, &c., prescribed by regular working-plans or annual plans-of-operations, are carried out completely and in a workmanlike manner; that all orders regarding fire-protection, closure against grazing, &c., are effected in the manner and to the extent laid down in the working plans and plans-of-operations; that the necessary entries to this effect are made in the Control books; and that any special works, not specified in the plan-of-operations, which he may have been ordered by competent authority to carry out, are carefully executed.
- (d) The Range-Officer is in direct executive charge of all works of silviculture, improvement, exploitation, and of special works which he may at any time be directed to carry out, or which may be in progress in his range, either under the prescriptions of working-plans, or under the special orders of the Divisional Forest Officer.
- (e) The Beat-Officer is charged with the supervision of works of silviculture, improvement and exploitation, as well as of any special works which he may have been ordered by the Range-Officer to carry out.

Finance. XXI.—The Conservator shall be the controlling authority in all matters of finance; and, subject to the rules contained in the Departmental Code, he may address the Local Government direct on such matters.

Organization and discipline of establishments. XXII.—As regards organization and discipline of establishments, the following rules are prescribed:—

- (a) The Conservator shall be the controlling authority, subject to the orders of the Local Government, in all matters regarding appointment, promotion, reduction and dismissal in the subordinate branches of the Forest Service in his circle, and in matters of departmental discipline, and may address the Local Government direct on all such matters.
- (b) The Divisional Forest Officer in charge of a forest division is *ex officio* the Assistant to the Collector, or, as the case may be, to the Assistant Collector in charge of an independent revenue sub-division.

XXIII.—The Divisional Forest Officer has, subject to the provisions of the Forest Department Code, entire control of the executive and subordinate forest staff in his division.

The officer in charge of a range is, as a rule, directly subordinate to the Divisional Forest Officer; but the Local Government may direct that he shall in the first instance be subordinate to an intermediate officer.

In the same way, the officer in charge of a beat is ordinarily directly subordinate to the Range-Officer; but, in cases where the range is exceptionally extensive, the Beat-Officer may, under the orders of the Conservator, be subordinate in the first instance to an intermediate officer.

XXIV.—The Conservator of Forests shall correspond direct with the Divisional Officer and issue orders to him on the following subjects:—

- (a) All matters directly relating to accounts and to expenditure and revenue in the forest division.
- (b) All matters of a purely technical nature, such as development of trees; sowing and planting; elaboration of the system of fire-protection; valuation surveys; the collection of technical data required in the preparation of working-plans; the manner of executing thinnings or improvement cuttings; felling; converting, transport and storing of timber and firewood; the disposal of material available under working-plans; plans-of-operations.
- (c) Such miscellaneous subjects as the purchase of departmental cattle, stores, tools and plant, books, maps, &c.
- (d) Matters of discipline.

XXV.—All correspondence with the Divisional Forest Officer on other subjects shall pass through the Collector, from or through whom orders shall emanate.

XXVI.—The Collector shall, in respect of such correspondence, ordinarily forward it under flying docket after perusal. But he may, whenever he deems it necessary, record his remarks on any communication addressed to the Conservator by the Divisional Forest Officer; and he may return, for reconsideration, any instructions addressed by the Conservator to the Divisional Forest Officer, recording the grounds on which he asks for reconsideration.

XXVII.—Should any instructions from the Conservator to the Divisional Forest Officer be returned by the Collector, and should the Conservator, on reconsideration, not deem it right to modify his orders, the Conservator will submit the case to the superior Revenue authority, who will, if necessary, forward it for the orders of Government.

The Conservator shall be kept regularly informed of all orders issued on forest matters by the Collector and the superior Revenue authority, and shall be consulted by them

previous to the submission of important questions for the orders of Government.

XXVIII.—All orders to the executive and subordinate staff in a forest division must emanate from the Divisional Forest Officer, or at least pass through, and be issued by, him.

XXIX.—The Divisional Forest Officer may, under the authority of the Collector, address letters and orders to subordinate Revenue and Police officers in matters in connection with which the Collector considers it convenient that the Forest Officer shall act without his intervention.

XXX.—All orders shall ordinarily reach the Range-Officer, from or through the Divisional Forest Officer. Should a superior officer give verbal instructions or orders to a Range-Officer and the Divisional Forest Officer not be present, the substance of the orders shall be communicated to the latter officer in writing. The Range-Officer shall make his reports and submit his accounts to the Divisional Forest Officer.

XXXI.—Similarly, all orders shall ordinarily reach the Beat-Officer through the Range-Officer. Should a superior officer give verbal instructions or orders to a Beat-Officer, and should the Range-Officer be absent, the substance of the orders shall be communicated to the Range-Officer in writing. The Beat-Officer shall make his reports and submit his accounts to the Range-Officer.

Diaries.

XXXII.—The Range-Officer shall, on such dates and for such periods (which under no circumstances should exceed half a month), as may be prescribed by the Divisional Forest Officer, draw up in his own hand a sufficiently full report or diary of all his movements and of all business of material interest or importance transacted by him during such period, and shall submit it to the Divisional Forest Officer.

XXXIII.—The Divisional Forest Officer shall, on the 1st and 16th of each month, draw up in his own hand a short but sufficiently full report or diary of all his movements, and of all business of material importance transacted by him during the preceding half-month. This diary shall include the substance of the more important facts recorded in the most recent diaries received from the Range-Officers, and shall be submitted to the Collector.

XXXIV.—The Collector shall forward, without delay to the Conservator, the Divisional Forest Officer's

fortnightly journal, making such remarks thereon as he may think fit.

Inspections
notes.

and inspection XXXV.—The Conservator may, from time to time, after inspecting the forests of any district in his circle, forward an inspection-note to the Collector, adverting more particularly to the following questions :—

Surveys and Settlements, made or in progress in his district; their cost; extent to which still required; nature and adequacy of maps and settlement records prepared; results of working under the settlements in force.

Working-Plans, already made or in progress; their cost; extent to which still required; results of working-plans in force.

Demarcation, nature and state of repair of boundary-marks; demarcation work in progress, its cost; work still to be done.

Roads, buildings, and other similar works, in existence or under construction; their cost; state of repair; new roads, buildings, or other works required.

Executive and protective staff, efficiency, state of discipline, &c.

Condition of the forests, methods of treatment employed; natural reproduction, causes which interfere with it, &c.

Protection of the forests from injury by man, by cattle, by fires, &c.; breaches of forest rules, their frequency and causes.

Works of reproduction and cultural improvements, extent, condition, and cost of plantations, made; condition of nurseries; new sowings or plantings required; thinnings, creepercutting, &c., extent to which carried on and required.

Methods of working and management in force, advantages or otherwise of methods; expenditure incurred; outturn of forests; financial results.

Timber dépôt, situation and adequacy; condition in which maintained; state of records, &c.

A copy of every such note should be submitted to the Local Government by the Conservator.

Transfer to Conservator
powers and duties.

XXXVI.—In compact forest areas, by the management of which the surrounding population is not appreciably affected, the Local Government may transfer to the Conservator by a general order any or all powers and duties of the Collector under these rules.

IV.—REVIEWS.

The beginnings of the Royal Botanic Gardens at Calcutta.

We have received a copy of a pamphlet recently issued from the Bengal Secretariat Press with a short account of Colonel Kyd the founder of these gardens.

Col. Kyd was born in 1746 and died in Calcutta in 1793, being then Military Secretary to Government, and a Royal Engineer. It was in 1786 that he submitted to the Governor-General his plans for making a Botanic Garden as the account says :—

“Colonel Kyd conceived the idea of supplying the Company’s Navy with teak timber grown near the ports where it could be used in ship building, and of increasing their commercial resources by introducing into India the cultivation of the species which in those days, formed so important an item in their trade, but for supplies of which they had to depend on their factories in Sumatra and Penang. He communicated this idea to the Governor-General of the day ; and, in a letter written on 1st June 1786, he officially submitted a scheme for the establishment of a Botanical Garden, or Garden of Acclimatization, near Calcutta. This scheme also included proposals for introducing, into territories subject to the Company, the cultivation of cotton, tobacco, coffee, tea, and various other commercial products.”

His proposals were very favourably received both by the then Governor-General (Sir John Macpherson who was acting after the departure of Warren Hastings,) and by the Court of Directors and the garden was established.

For us the most interesting matter is the idea that Col. Kyd had of growing teak near the seaport towns, and a plantation was actually made on the land which was recently the ‘Bishop’s College’ and is now the Sibpur Engineering College. On this the account says :—

"The part of the Botanic Garden nearest to Colonel Kyd's house was devoted to the planting of teak trees, in accordance with the Company's earnest desire to supply themselves with timber for ship-building. The experience of thirty-four years having shown that good teak timber cannot be successfully raised on the muddy soil of the Gangetic delta, this part of the garden (extending to about 40 acres) was in the year 1820 given up by Government to the Lord Bishop of Calcutta (Dr. Middleton) as the site of a Christian College."

Of course, it is hardly surprising that the teak did not succeed, although it grows by no means badly about Calcutta. Had it been mahogany, perhaps it would have remained and there might be now a valuable piece of forest. We have heard of similar experiments as regards teak having been tried near Rangoon, but also unsuccessfully.

Report on Canal Plantations, N.-W. P. for the year ending 31st March, 1892.

The Report for 1891-92 was reviewed in our number for April 1893. The present Report consists of a mass of statistical tables which are somewhat bewildering. However, we see that the financial results were very good as the *net* revenue was Rs. 1,53,824 a very considerable increase on that of the previous year. More than half of this amount comes from the Upper Ganges Canal.

The area of the plantations is ac. 37,052 so that the net revenue per acre is Rs. 1,462. The number of 1st class trees, that is trees of six feet girth and over is 44,890.

The Report says nothing as to what is the system of working and whether a permanent annual yield is arranged for—the points which a Forest Officer would most like to hear about. Nor is any information given on the subject of the progress of the Eucalyptus plantation to which we referred last year. That things are not all going quite rightly as regards reproduction is clear from the statement that 're-stocking is not keeping pace with the felling' on the Lower Ganges and Agra Canal. But there can be no doubt that the plantations constitute a valuable property and one which, under a system of Working Plans of a simple character ought to improve and even more than at present meet the requirements of the neighbouring villages.

V.-SHIKAR AND TRAVEL.

A Man-eater.

SIR,

As all authentic accounts about the ways of man-eaters are interesting, I asked the writer of the following letter to give me details of his recent experience, for publication in the *Indian Forester*. As it is well to fix the responsibility of all such stories, I hope my friend will permit me to give his name (Mr. P. B. Thomas of the Madras Police,) and I sign this introductory note.

VIZAGAPATAM,
10th October, 1893.

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P. W. PEET.

For over three years a man-eating tiger had been ranging through an out-of-the way corner of the Northern Circars, and for over three years no one could get a chance at the cunning brute. The country was a "big" one, well watered even in the hottest weather by several rivers that never dried up and consisting for the most part of jungle clad hills lying at an elevation of from two to four thousand feet. The country swarmed with game, principally bison, and the few villages in it lay at long distances apart, each buried in its own remote valley, and containing at the most some ten or fifteen huts.

The man-eater used to range over about 25 or 30 square miles of the country and though he shewed great audacity in his kills, frequently taking a man or woman in broad daylight in full view of the village, yet he never killed within 15 or 20 miles of his last kill, and seldom at shorter intervals than a fortnight or three weeks. He was said to be particularly partial to bison, and many a time had I felt very "creepy" when tracking them through the jungle he used to frequent; though the natives always said of this tiger that he never attacked a party of 3 or 4 men together and seldom killed anyone in the jungles; preferring to pounce on single unprotected people on the outskirts of a village.

Under these circumstances it is easy to understand that any systematic shikarring of the beast was out of the question. The only thing was to wait till he "gave himself away" by a lucky chance, and that chance came about in this wise.

A friend "B" and myself were encamped near a small police station in August, and having a very good time of it amongst the bison; we had already brought a tigress to book at this camp but had only once heard of the man-eater, who had killed some 20 miles from camp. However the "khabar" was days old when it reached us so we could do nothing.

One morning I got back to camp about 12 o'clock, having been out since five after bison without finding any fresh tracks. B. was out in another direction. About one o'clock some men came in with the news that the man-eater had killed a man six miles off at ten that morning. I started off as soon as possible with an elephant and some tins of soup, and got out to the place where the man had been killed about four o'clock. He was making a clearing in the jungle in company with two other men and seemed to have just finished felling a tree when the brute carried him off in full view of the other two men. His axe and upper cloth were still lying where he had been standing.

Without a moment's delay I followed the broad track through the grass where the body had been dragged along, sitting on the elephant, and keeping a bright look-out. Some natives followed the elephant to assist in making a machan when we found the body.

This we did about half a mile off in some very thick dwarf bamboo jungle. The head was severed from the body and gnawed all over, and one leg had also been eaten. A machan was quickly constructed, and I got into it about five o'clock, sending the elephant and people away with orders to wait at the clearing where the man had been killed till they heard a shot. The elephant was then to come back for me.

It was a pouring wet night and there was no moon; so after watching till long after dark I fired a shot to call the elephant, and went back to a village some two miles off where I cooked a tin of soup and slept.

The next morning at dawn I started out again on the elephant but on getting to last night's machan we found that the body had been removed and an examination of the track showed that it had been dragged off only a very short time before we arrived; the shot I had fired in the evening probably prevented the tiger touching the kill till the early morning.

We found the body again a quarter of a mile further on. The trunk, one arm, and one leg still remained. There was a trampled space in the grass three yards in diameter, where the brute had evidently been rolling on the kill; but the body had been pulled under a small bush at a distance of 2 or 3 yards from this, evidently with the object of secreting it. It lay just above the bank of a deep nullah, with a small stream running along the bottom of it. The jungle was thin, but the grass very thick and nearly waist high. The nullah was fringed with bamboo.

We immediately made a comfortable machan in a tree some twenty yards from the trampled space alluded to and dragged the body into the middle of this space. This took about an hour, as I expected to have to wait all day and took care to make the machan big and shady, the day being hot. An old Police Head

Constable with me then produced three leaves of the "maddi" tree and seven leaves resembling those of an English lime tree in shape, only bigger and coarser. These leaves he placed under the body with great care telling me that it was quite hopeless to expect a shot unless this little arrangement was made.

He and I then got into the machan, telling the other men to go away with the elephant talking as they went. They did so, and all was silence. The Head Constable whispered to me that we had better take it in turns to watch, as the tiger was very unlikely to come till the evening.

We had been watching barely twenty minutes before I heard a rustle in the grass right in front of the machan, and in another second a magnificent tiger walked quickly out of the nullah, and stood for a moment on the bank. He was too much covered by jungle to give a certain shot so I sat motionless. He then turned sharp across me, and moved towards the trampled space where the body lay, exposing his shoulder fully. I raised my express quietly, but his eye caught the motion at once, and he looked quickly up towards us. I could only see half his head round the corner of a bamboo, and hesitated whether to shoot or not, but luckily he had not made me out and moved his head to get a better view, thereby exposing it completely. I immediately put in a bullet over the right eye, which rolled him over and as he lay kicking, another into the white of his belly. He still kicked, and I was not going to let him get up if I could help it, I put in four more shots; kept on at him in fact till he stopped kicking.

We then summoned the elephant and went up to him giving him a shot in the head to make all sure, as he was still breathing.

He was a fine tiger in perfect condition. Two of his fangs were broken, and were mere stumps, but he had nothing about him to account for his being a man-eater. He was very fat, and a heavy animal, 20 inches round the forearm but his length was only 9 ft. 5 in. However it was as much as we could do to pad him, even after he had been cleaned.

The record of kills attributed to this tiger from January 1891, to the date on which he was shot, was 45. He had on two occasions killed two women together, though he ate only one on each occasion. He had killed several people previously to 1891, but I do not know how many. I think that his singular want of wariness on the occasion on which he met his death was due to his never having been driven off a kill before. All that had ever been found of his previous victims were the bones. I do not think he had ever been shot at before, and there were no old bullet marks on him anywhere. He was probably one of a litter that had been brought up to man-eating.

P. B. T.

VI-EXTRACTS, NOTES AND QUERIES.

The Adirondack Park.

There must have been some public interest in the woodlands of this state considerably more than half a century ago, or Governor DeWitt Clinton would not have sent a message to the Legislature in which he insisted upon the importance of sustaining the productive capacity of its forests. This sentiment had grown so strong by 1872 that a Commission with Horatio Seymour at its head, was appointed to enquire into the expediency of legislation for vesting in the State the title to the timbered Adirondack region and converting it into a public park. It would have been comparatively easy then to acquire these lands, but public opinion was not ripe for the project and as acre after acre of the forest has disappeared, the difficulties in the way of rescuing what remains have become greater and greater. The bill drawn up with care by the Commission of '85 was not adopted, and a substitute containing only a few of its features was enacted, but the destruction of the timber and the absorption of the land by various corporations and individuals has gone on as before. This imperfect scheme has now been superseded by another plan of administering the state forest-lands, embodied in a bill to which Governor Flower has just affixed his signature. How much this will accomplish in the way of saving the remnants of the North Woods depends largely on the intelligence and the executive force of the forest-commission just named. The measure is not such a one as has been recommended by those who have given the most study to the subject, but it may embody most of the protective provisions which it is possible to enforce until public opinion becomes more thoroughly educated. We have often expressed the opinion that a forest tract which is such an important factor in the welfare of the entire community as the North Woods should belong to the community, and that state ownership in fee-simple is, therefore, the only final and satisfactory solution of the problems involved.

The first part of the act just passed relates to all the forest-preserves throughout the State, but the important part of the law is that concerning the Adirondack Park, which sets apart certain townships in the countries of Hamilton, Franklin, Herkimer, St. Lawrence and Warren to be held in forest for the preservation of the chief rivers of the State and its future timber-supply and for the free use of the people for their health and pleasure. The State already owns a half-million acres within the boundaries of this park, and the novel feature of the bill is an effort to gain control of about as much more land for Park purposes, while leaving it to be owned as it now is by private individuals. The proposed convenient is, that in return for the remission of taxes on these lands by the State their owners shall contract to refrain forever from removing any of the timber thereon which is less than twelve inches in diameter at a height of three feet above the ground, except that the owners have the right of clearing for domestic purposes one acre in each one hundred of forest-land covered by the contract. The commissions also have the authority to issue leases of not more than five acres in one parcel for the erection of camps or cottages under conditions prescribed by them. They are also empowered to sell fallen timber and timber "injured by blight or fire," and standing timber which shall measure twelve inches or more in diameter three feet from the ground, the proceeds of which shall be credited to the fund for purchasing other land within Adirondack Park. They have the power to sell the portions of the 250,000 acres of forest-land owned by the state without the Park and to apply the money thus received to the purchase of land within the park, and they may exchange directly State lands without the park for lands within its boundary. Finally, they may buy lands within the park and leave the present owners the privilege of cutting down timber above the regulation size for fifteen years. This is an attempt at the gradual acquisition by the State of land which it is considered too expensive to take at once.

As we have said, the immediate value of this legislation depends on the quality of the commission just appointed. The power to lease tracts for camp-grounds and to make compacts for a divided ownership of the land may result in the establishment of many small parks which are practically private property, or in which the people have, at most, but few rights. The privilege to sell large timber is dangerous. If the proper method of cutting and transporting this is not strictly prescribed and enforced, great damage may be done to the smaller trees. No doubt, it is right for the State to sell its forest-products, for this is the only legitimate revenue which can be expected from the land. But this should only be done under the supervision of trained foresters, and with such men in charge there would be no need of fixing a limit to the size of the trees to be cut. A skilled forest-master knows what trees to cut, whether they are large or small, without any assistance

from Legislature. In many instances, for example, it would be advisable to thin out small trees of inferior kinds to aid the growth of better kinds. For the present, however the restriction as to the diameter of timber felled may be on the side of safety. It would be easy to criticise other details of the Act. But if a better law would fail of enforcement, owing to the lack of enlightened popular sentiment behind it, and if it is impossible to find men to whose charge the forest can safely be entrusted, the proper attitude now of all patriotic citizens is to encourage the commissioners in well-doing as they deserve it, to watch their conduct closely and point out mistakes of administration when they are made, and to continue through the press and otherwise to educate the people as to the vital importance of this forest to them and their children, until they are jealous of the slightest encroachment upon their right to have it preserved and perpetuated.—(*Garden and Forest*).

World's Fair Notes.

The following Extract from the Chicago 'Evening Journal' was sent to one of our correspondents by W. H. Norman Tod of the Forestry Building, World's Fair.

People who live south of the World's Fair grounds and enter by the extreme south eastern gate catch a good many exhibits missed by the men who enter by the Esquimaux village three miles away. After tramping across sand and prairie from their hotels, they show a predilection for sitting on the shady side of the Forestry Building and resting awhile before commencing the serious task of examining the Exposition. Almost invariably they enter the Forestry Building, and, if they are people of taste, with eyes which appreciate beautiful things, remain there until they have mastered its contents.

There has never before been seen such a show of woods, in the rough and finished states, as this building contains. It is itself constructed of an immense variety of woods collected from every State in the Union. Interesting as this may be to the lumber man and builder, they do not catch the eye of the visitor who is looking for the beautiful and the curious as do the specimen woods exhibited within. Here again the States are represented and many of the countries of the world. There is instruction and education in even a cursory glance at the exhibits; but if the

visitor is inclined to go deeper and seek information from the men in charge, there is more to be learned than a week's study will enable him to assimilate.

INDIA'S EXHIBIT INTERESTING.

Especially fruitful of interest is the exhibit made by British India. As a Government exhibit, in which private enterprise is in no way interested, it is both complete and authoritative. It illustrates not only the varieties of woods found in British India, but also the methods used in the Department of Forestry, which is fast becoming considered as important as any great governmental enterprise. Outside of the mercantile value of the timber, the chief interest of the exhibit for American visitors lies in the fact that the science of forestry as practiced in India affords a great many practical lessons for the United States. Here, as there, the destruction of timber lands is becoming an important question both on account of its influence on the climate and the lessening of a very necessary commercial product, and many of the same remedies apply to both. Forestry in India is a comparatively modern institution. There can be little doubt that in prehistoric times when the climate of the country was less fierce than now, the greater part of the country was covered with dense forests but the hands of invading hordes from the north were perpetually turned against them, and thousands of square miles disappeared by fire. When the English took possession, a new impetus was given to the destruction of forest as further vast areas were denuded to increase the area of cultivation. There soon came a time, however, when the attention of the Government was drawn to the lessening of the forests by the lack of timber in certain districts for public works.

FORESTRY MADE A SCIENCE.

Then the Forest Department came into existence and forestry became a science in India. Acts were passed for the creation of Government reserves, for the constitution of village forests and for the provision of police rules necessary for the protection of forests and forest produce. The department was officered by men who had received training in scientific forestry in England, France and Germany. Most Indian forests are of a mixed character, containing only one or a few valuable species which will repay the cost of working. Contractors handle the products of Government forests under the supervision of department officials. The deciduous forests, which occupy the greater part of the peninsula, Burmah, and the Andaman islands, are of the greatest importance for the forester, the consumer, and the Government. They contain well-known and valuable species of timber, such as teak, sal, ironwood

sandalwood, red sanders and padouk. The first and the last named have the most promising future. Padouk, or "vermillion," as it is called by American importers, is reckoned a better wood than teak, lasting longer and being handsomer. It is the best wood for carriage building and will one day rival mahogany for cabinet work. Teak takes the first place, however, in the estimation of visitors to India's section in the Forestry Building, for from it has been carved a magnificent doorway which is the equal of the best wood-carving to be found in the Exposition. This is the work of a Burmese carver in Mandalay and was executed by him to the order of the Conservator of Forests for Upper Burmah.

BEAUTIFUL SPECIMEN OF CARVING.

The general outlines and designs are the same as those used in the throne of the King of Burmah. It stands fourteen feet high and is proportionately broad. Every inch of post and lintel and folding doors is carved with curious mythological figures, images of Buddha and minor deities. Below, it is supported by two dragons, which, as do all the figures, display more than a trace of Chinese art, induced by the intercourse between China and Upper Burmah. The best carving is contained in a triangular space above the door, which is designed to show the city of Mandalay with the King and his courtiers. Of three tiers in the triangle, the first shows one of the famous seven gates of the city surrounded and guarded by evil spirits; the second shows the King's ministers, and the highest tier the King and his Queens in the palace. Other valuable pieces of carving are exhibited to show to what uses India's woods may be put. A mantelpiece made of half a dozen varieties was wholly designed and carved by the Sikh carpenters. A cabinet and tables show what a fine polish padouk will take; and two stands for flower vases are carved in representation of a pelican standing upon four turtles.

For the student, a variety of maps, diagrams and instruments illustrate the methods employed in mapping out forest areas and the precautions taken against fire. Commercial men will find besides the timbers a full exhibit of tree products, resins, oil and gums.

Another correspondent has kindly sent us the following cutting from the Chicago 'Daily Inter-Ocean' regarding the carved teak doorway which was sent as an exhibit to the World's Fair by the Burma Forest Department. We feel sure that it will amuse our readers as it has amused us. Our Madras readers will not fail to be surprised at the antiquity of Vijianagar; our Burma subscribers will not less be astonished to hear that the Kings of Burma were Hindoos and our Inspector-General will read with some amazement how the great doorway was carved in the snug recesses of his Simla retreat.

WOOD CARVING IN INDIA.

Art attracts in the Indian exhibit, adjoining the Japanese at the north end of the building. Native workmen and native wood have combined to present an exhibit, which would be numbered among "the seven wonders of the world," were they to be named and grouped at the Columbian Exposition. The exhibit consists of a massive double door, with lintel, sill and frame, carved from teak wood. Ponderous, high and wide, the carving has been so daintily wrought that the doors look as if they were web and the whole piece looks frail and perishable, while in fact doors, frame and the handiwork of the craftsmen is durable as time, for teak wood is as imperishable as bronze, more enduring, for just alongside of these doors is a handsomely carved mantelpiece, cut, chiseled and polished from teak wood 600 years old; hopwood, walnut, and fragments of blackwood, the Shisham of the Bible, taken from the ruins of the presidency of Madras, whose erection ante-dates the Christian era.

The teak doors are most elaborately and skillfully carved; figures, mythological, allegorical and representative abound. Scenes about Mandalay, the capital of Upper Burmah, are portrayed; the king enthroned, surrounded by courtiers; heraldic accounts and legends are carved in relief while the figures great and minute are surrounded by intricately wrought scrolls and delicate tracing, lace-like in fineness. The doors are the reproduction of the entrance to the palace at Mandalay, made of the same wood and which have swung to and fro for many, many generations of Hindoos. The reproduction is the work of six native carpenters who carved the gigantic doors at Ava Lodge, Simla, under the supervision of the British Conservator of Forests of the Eastern Circle of Upper Burmah.

India, divided into the presidencies of Bombay, Bengal and Madras, has a large exhibit, every district of the vast empire being represented. Teak, yellow and black in color, a tough, fine-grained and everlasting wood, is commercially the most valuable, and while suitable for furniture, is so universally useful that in ship-building it is found to have no equal to stand the buffeting of storms, the change of climate and the encroachments of boring sea insects. Having an inexhaustible forest supply, the woods of India are countless in variety, valuable commercially and there is scarce a variety that is not serviceable. Childhood's geography has pictured the famous banyan tree, whose branches stretch out, descend and taking root again, make an arcade of shade. This tree is the most useful on earth for shade purposes, and in a country where the sun is ever in an angry mood, red hot, has its rivals among the merchantable woods of the river valleys and the mountain ranges of Hindostan.

Japanese Camphor.

An interesting account of the production and trade in camphor in Japan is contained in the last British consular report from Hiogo. The camphor tree of Japan is a huge evergreen of singularly symmetrical proportions and not unlike a linden. Its blossom is white flower, and its bears a red berry. Some trees are fully 15ft. in diameter and are upwards of 30 years old. The annual export of Japan camphor averages about 5,000,000 lbs., of which about a quarter reaches the United States either direct or *via* Europe, excepting a small quantity sent to India. The districts in Japan famed for camphor trees are Klushin, Shikoku, Iga, Suruga Isé, and Kishiu. The forests owned by the people are now almost denuded of timber, and very little will be left a few years hence, but the Government forests are still very rich in camphor trees, and it has been estimated that these alone will maintain annually, during the next 25 years, the full average supply of crude camphor. Formerly very little care was bestowed upon the preservation and cultivation of this valuable timber. More recently, however, not only the Government, but also the people, have been giving to it the attention it long ago deserved. Numerous young trees have now been planted, and their growth is being carefully tended. Consequently, although hitherto the youngest wood from which camphor was extracted was about 70 or 80 years old it is expected that, under present scientific management, the trees will give equally good results after 25 or 30 years. The roots contain a much larger proportion of camphor than the trees, 10lbs of crude camphor out of 200lbs. of wood chips being thought satisfactory. The Suruga timber yield a much smaller percentage. In a village in Tosa there is a group of 13 trees about 100 years old. It has been estimated that they will produce 40,000 lbs. of crude camphor, and are worth, as they now stand, 4,000 silver dollars. It appears that the process of extracting camphor from the wood among the mountains and the materials used are of the roughest and most unscientific description. The wood-chips are boiled, the vapour being conducted into a receptacle containing several partitions surrounded by cold water. In the sides of these partitions are apertures alternating in contrary directions, which when open cause the vapour to fill the divisions by a circuitous route, thus improving the grain of the camphor. The crude article is brought to market in very rude wooden tubs. To make it fit for shipment requires much work and experience. Each tub is carefully sampled vertically and diagonally, and the samples are tested by fire and sometimes by alcohol. If no solid adulterant is discovered, the condition of the drug is next ascertained, for crude camphor contains a quantity of water, or oil and water, varying between 5 and 20 per cent. The rest of the work is comparatively easy, and consists in weighing, cutting, mixing, and packing for shipment, packing being in tubs prepared on the premises partly out of the original packages.

Churchill and Sim's Circular.

November 3rd, 1893.

EAST INDIA TEAK.—The deliveries for the first ten months have been 11,276 loads as compared with 8,434 loads and 12,321 loads for the same period of 1892 and 1891 respectively. In October, the figures for the three years are 1158 loads for 1893, 778 loads in October 1892, and 929 loads in October 1891. The market has been steady, without change for quotation. The market for wood afloat has been rather stronger, but is now in suspense until the result of the tendering for the requirements of the British Admiralty are known. These will absorb fairly considerable quantities and will be taken entirely from Burmese ports in accordance with official precedent.—

ROSEWOOD.—The demand is dull and to effect sales concessions in price are necessary.

SATINWOOD.—Logs, If large and figury, realise very fair prices, but plain wood is dull of sale and for *planks* and *boards* there is no demand.—

EBONY.—Prices continue to rule low, but there is now rather more enquiry for this description.—

Price Current.

India Teak	...	per load	£ 9-10s.	to	£15-10s
Satinwood	...	„ ton	£ 5	to	£12.
Rosewood	...	„ „	£ 5	to	£ 9.
Ebony	...	„ „	£ 5	to	£ 7.

Cawnpore Price Current.

November 30th, 1893.

		Per Maund					
		Rs.	As.	P.	Rs.	As.	P.
Aonla fruits, dried	...	0	10	0	to	0	12 0
„ leaves, dried	...	1	12	0	to	2	0 0
Babul bark	...	0	8	0	to	0	9 0
Bahera	...	1	8	0	to	1	10 0
Stick Lac	...	24	0	0	to	25	0 0
Myrabolams	...	3	8	0	to	3	12 0
Moonj grass	...	1	4	0	to	1	8 0
Babul gum	..	8	0	0	to	12	0 0
Mixed gum	...	9	0	0	to	10	0 0

VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—GAZETTE OF INDIA.

29th November, 1892.—No. 4760—S. R.—In exercise of the powers conferred by Section 8 of the Indian Stamp Act (I of 1879), the Governor-General in Council is pleased to remit the duties payable on the agreements and security bonds required to be executed, under the Rules to regulate appointments and promotions in the Provincial Forest Service, by students and their sureties previous to entry into the Forest School, Dehra Dun.

9th December, 1892.—No. 1491—F—ERRATUM.—In the Notification of this Department, No 1328—F., dated the 28th October last for the date, 29th December, 1891, entered against the names of Messrs. Hatt, Trafford, and Long, read “28th December 1891.”

2.—MADRAS GAZETTE,

1st December, 1892.—No 553.—Mr. F. A. Lodge, District Forest Officer, Cuddapah, is granted furlough for one year, under articles 340 (b) of the Civil Service Regulations, with effect from 7th January 1893.

7th December, 1892.—No. 436.—Under the provisions of section 2 of the Madras Forest Act (V of 1882), the Right Honorable the Governor in Council is pleased to empower M. R. Ry, B. Ramachandra Rao, Deputy Tahsildar and Third class Magistrate of Piler, in the district of Cuddapah, to try forest offences.

14th December 1892.—The two months' leave granted to Rauger Lakshman Rao, and notified at page 1468, Part II of the *Fort St George Gazette*, dated 25th October 1892, is extended up to 8th January 1892.

3.—BOMBAY GAZETTE.

28th November, 1892.—Messrs. E. G. Oliver, Deputy Conservator of Forests and R. H. Madan, Extra Assistant Conservator of Forests, respectively delivered over and received charge of the Divisional Forest Office, East Khândesh, on the 15th November 1892, in the afternoon.

12th December 1892.—No. 4911.—Mr. C. Greatheed, Deputy Conservator of Forests, has been allowed by Her Majesty's Secretary of State for India to return to duty within the period of his leave.

No. 5062.—Mr. L. S. Osmaston, Assistant Conservator of Forests, has been allowed by Her Majesty's Secretary of State for India an extension of leave on medical certificate for two months.

4.—BENGAL GAZETTE.

5th December, 1892.—No. 4212.—Consequent on the return of Mr. H. H. Davis, Deputy Conservator of Forests, 1st grade, from the leave granted to him in the Notification, dated 4th June, 1891, the following reversions are ordered in the Upper Controlling Staff of the Bengal Forest Department, with effect from the 3rd November, 1892 :—

Mr. E. G. Chester, Officiating Deputy Conservator of Forests, 1st grade, to revert to Deputy Conservator of Forests, 2nd grade.

Mr. C. G. D. Fordyce, Officiating Deputy Conservator of Forests, 2nd grade, to revert to Deputy Conservator of Forests, 3rd grade.

Mr. G. A. Richardson, Officiating Deputy Conservator of Forests, 2nd grade, to revert to Deputy Conservator of Forests, 3rd grade.

5.—N. W. P. & OUDH GAZETTE

13th December, 1892.—No. 5636.—Pandit Sadanand, Forest Ranger, 2nd grade, to be Extra Assistant Conservator of Forests, 4th grade with effect from the 23rd July, 1892.

16th December, 1892.—No. 5696.—Pandit Sada Nand, Extra Assistant Conservator of Forests, is attached to the Jaunsar Forest Division, in the School Circle, with effect from the date of taking charge of his duties.

6.—PUNJAB GAZETTE.

2nd December, 1892.—No. 545.—Messrs. L. Gisborne Smith and J. H. Lace, Deputy Conservators of Forests, respectively made over and received charge of the Direction Division and the duties of Personal Assistant to the Conservator of Forests, Punjab, on the forenoon of the 19th October, 1892, consequent on the latter's return to duty from the privilege leave granted him in *Punjab Government Gazette* Notification No. 725 S., dated 23rd September, 1892.

Mr. Lace holds charge of the Personal Assistantship in addition to his other duties.

9th December, 1892.—No. 564.—His Honor the Lieutenant-Governor of the Punjab is pleased to make the following promotion with effect from the 1st October, 1892 :—

Sadhu Singh, Forest Ranger, to be Extra Assistant Conservator of Forests, 4th Grade.

Note.—When Daulat Ram rejoins he will be ranked above Sadhu Singh.

24th December, 1892.—No. 595.—Mr. G. G. Minniken, Deputy Conservator of Forests, is granted privilege leave for 1 month and 10 days, under Articles 277 and 291 of the Civil Service Regulations, with effect from the 1st January, 1893, or from such subsequent date as he may avail himself of it.

—CENTRAL PROVINCES GAZETTE.

8th December, 1892.—No. 4786.—Mr. H. S. K. Edie, Assistant Conservator of Forests, is transferred from Nagpur to the Chhindwara Forest Division.

Mr. Edie relinquished charge of his duties at Nagpur on the afternoon of the 4th November, and assumed charge of the Chhindwara Division from Mr. M. W. Fox-Strangways, I. C. S., Deputy Commissioner, on the forenoon of the 9th ultimo.

15th December, 1892.—No. 4870.—With reference to Notification No. 2618, dated the 26th July, 1892, Khan Sahib Munshi Mahomed Ghouse, Extra-Assistant Conservator of Forests, returned from the privilege leave granted to him, and assumed charge of the Raipur Forest Division from Colonel W. S. Brooke, Deputy Commissioner, Raipur, on the forenoon of the 28th ultimo.

No. 4872.—Mr. A. A. Watson, Assistant Conservator of Forests, has been granted, by Her Majesty's Secretary of State for India, three months' leave on medical certificate, in further extension of the leave on medical certificate granted him by Notification No. 2514, dated the 21st July, 1892.

21st December, 1892.—The following transfers of Rangers in the Mandla Forest Division are made in the interests of the public service, with effect from the 1st November, 1892 :—

Alli Muttaki, Forest Ranger 1st grade, from the Dindori to the Shaipura Range.

Srideo Bajpai, Forest Ranger 5th grade, from the Shaipura to the Dindori Range.

8.—BURMA GAZETTE.

30th November, 1892.—No. 295.—At the departmental examinations held at Rangoon, Monywa, and Mambu on the 7th November, 1892, the following officers passed the examination in Forest Procedure and Accounts for Forest Officers prescribed in Chapter IV of the Departmental Examination Rules :—

Mr. H. N. Thompson, Assistant Conservator of Forests.

Mr. J. Messer, Assistant Conservator of Forests.

Mr. A. M. Burn Murdoch, Assistant Conservator of Forests.

Mr. H. H. Forteath, Assistant Conservator of Forests.

No. 296.—At the departmental examination held at Rangoon, Monywa, and Mambu on the 7th November, 1892, the following Forest Officers passed the examination in Law and Revenue for Forest Officers prescribed in Chapter IV of the Departmental Examination Rules :—

Mr. H. N. Thompson, Assistant Conservator of Forests.

Mr. H. H. Forteath, Assistant Conservator of Forests.

Mr. M. Kavanagh, Extra Assistant Conservator of Forests.

26th November, 1892.—No. 28.—With reference to Revenue Department Notification No. 393 F., dated the 8th instant, Mr. F. J. Branthwaite, Officiating Deputy Conservator of Forests, made over, and Mr. W. F. L. Tottenham, Officiating Deputy Conservator of Forests, received, charge of the Pegu subdivision on the afternoon of the 20th instant.

No. 29.—With reference to Revenue Department Notification No. 393F., dated the 8th instant, Mr. J. Messer, Assistant Conservator of Forests, made over and Mr. F. J. Branthwaite, officiating Deputy Conservator of Forests, received, charge of the Working Plans Division on the forenoon of the 26th instant.

25th November, 1892.—No. 11.—With reference to Revenue Department Notification No. 325, dated Rangoon, the 13th October, 1892, Mr. H. H. Forteath, Assistant Conservator of Forests, made over, and Mr. C. W. A. Bruce, Assistant Conservator of Forests, received, charge of the Upper Chindwin division on forenoon of the 16th November, 1892.

30th November, 1892.—No. 13.—With reference to Revenue Department Notifications No. 390 and 391 (Forests), dated Rangoon, the 30th November, 1892, Mr. R. C. Dun, Assistant Conservator of Forests, and Mr. W. T. T. McHarg, Officiating Deputy Conservators of Forests, respectively, made over and received charge of the Bhamo Forest division on the afternoon of the 22nd November, 1892.

1st December, 1892.—No. 30.—With reference to Revenue Department Notification No. 364, dated the 22nd October, 1892, Mr. G. R. Long, Assistant Conservator of Forests, made over charge of his duties in the Toungoo division on the afternoon of the 5th November, 1892, and assumed charge of the Myanaung subdivision, on the afternoon of the 17th November, 1892.

1892.—No. 429.—In exercise of the powers conferred by sections 37 and 43 (a) of the Burma Forest Act, 1881, the Chief Commissioner adds the following provisos to Rule 8 of the Lower Burma Forest Rules published in Revenue Department Notification No. 327, dated the 14th October 1892, in supersession of provisos 2 and 3 of the said rule. Proviso (2) of this notification will come into force at once. Proviso (3) will come into force from the 1st January 1893 :—

(2) No person shall cut trees within two chains of the banks of any stream or of the outer edge of the berm of any public road to which the Deputy Commissioner of the district in which the stream or road is situated may by public notice declare this rule to apply. The notices published under this rule shall specify the points on the stream or road referred to between which the cutting of trees is prohibited, and shall be served on the headmen of all villages near and posted up at convenient places in such villages and along the banks of the stream or along the road. The Deputy Commissioner may cancel or vary by publication in similar manner any notices issued under this rule.

(3) (1) On all firewood brought to Rangoon, Pagu, Prome, Shwedaung, Paungdè, Yandoon, Henzada, Thayetmyo, Moulmein, Shwegyin, Toungoo, Tavoy, Mergui, and so much of Bassein as lies to the east of the Ngawun river there shall be levied the following fees :—

	Rs.	A.	P.
On firewood not exceeding 6 feet in length and 2 feet in girth, per 1,000 billets	10	0	0
On firewood not exceeding 4 feet 6 inches in length and 2 feet in girth, per 1,000 billets ...	8	0	0
On firewood not exceeding 4 feet 6 inches in length and 1 foot in girth, per 1,000 billets ...	2	8	0
On firewood not exceeding 3 feet in length and 1 foot in girth, per 1,000 billets... ..	1	0	0

On firewood, small, in bundles of 10, not exceeding 1 foot in length, per 1,000 bundles	...	1	0	0
On firewood, per log or billet of other dimensions	...	0	4	0
On firewood, per cart-load	... ..	0	4	0

Or at the option of the person paying the fees in the case of firewood brought in split and stacked, the following fees :—

For a stack 6' x 6' x 6'	...	...	1	4	0
For a stack 6' x 5' x 3'	...	...	0	8	0

Or, at the option of the person paying the fees, at the rate of Rs. 6 per stack of 1,000 cubic feet.

(ii) The fees prescribed in the foregoing clause shall be levied, in the case of firewood brought into Rangoon, at one or other of the collecting stations at Alón, Pazundaung, Botataung, William Street wharf or Sinnmaleik.

In the case of the remaining towns mentioned in the foregoing clause the fees shall be levied, if the firewood is brought by boat, at one or other of the landing-places mentioned in the second column of the following table, and, if the firewood is brought by land, at any place on the routes mentioned in the third column, which the Chief Commissioner prescribes to be the only routes by which firewood shall be brought by land into the said towns :—

Town.	Landing-places.	Land routes.
Pegu ..	(1) The river-bank near the Forest revenue station.	(1) The Rangoon road.
Prome ...	(2) The river-bank between the water-works and the Forest office.	(1) The Shwedaung road. (2) The old Myedè road. (3) The new Myedè road.
Paungdè —	.....	(1) The Shwedaung road. (2) The Tapun road. (3) The Hmattaing road. (4) The Nattalin road.
Shwedaung ...	(1) The river-bank opposite to the bazaar.	(1) The Prome road. (2) The Paungdè road.
Yandoon ...	(1) The river-bank at Kyundeik (2) The river-bank at Zeseik (3) The river-bank at Yônseik	(1) Firewood to be brought to the landing-places prescribed in column 2.
Henzada —	(1) The river-bank opposite to the bazaar. (2) The river-bank near the Government timber depôt.	(1) The Neikban road. (2) The Ingabo road.
Thayetmyo ...	(1) The river-bank between the Thana road and the Okpo road.	(1) The Mindôn road. (2) The Mindè road. (3) The Strand road. (4) The Tôndaung road.
Toungoo ...	(1) The Government timber depôt	(1) The Kanyo road. (2) The Kinzeik road.

Town.	Landing-places.	Land route.
Shwegyin ...	(1) The river-bank at Pynma-binzeik.	(1) The Kywedè road. (2) The Circular road. (3) The Payagyi road.
Moulmein ...	(1) Nantè ... (2) Battery point Government timber depôt. (3) The Mapun chief jetty.	(1) The Amherst road.
Tavoy ...	(1) The Sinzeik Government timber depôt. (2) The depôt below Messrs. Crisp and Co.'s mill.	(1) The Siam road.
Mergui ...	(1) The Nônklè Government timber depôt. (2) The shore above the stone bazaar.	(1) The Kalwi road.
Bassein in the east of the Ngawun	(1) Sinobo ... (2) The Government timber depôt ... (3) Kyaukungu ..	(1) The Sinobo road. (2) The Tadagyidan road. (3) The Shanywa road.

(iii) No firewood shall be brought into any of the towns referred to in clause (i) until the fees payable in respect thereof as prescribed in clause (i) shall have been paid.

(iv) Notwithstanding the provisions of clauses (i), (ii), and (iii) above, no fees shall be levied on head-loads of firewood brought by women into any of the towns mentioned in clause (i).

(4) (i) A fee at the rate of Rs. 6 per 1,000 cubic feet shall be paid on all firewood, being the produce of land at the disposal of Government, used by steamers, launches, railways, or brickfields in Lower Burma. Such fee shall be paid before the firewood is utilized. Consumers may, subject to the sanction of the Conservator of Forests, take out prepaid licenses in the form of license (Form XV) attached to these rules for the total quantity of firewood to be consumed during any fixed period not exceeding one year or, in the case of firewood intended to be supplied to the Railway, during any period. The fee for prepaid licenses shall be calculated at the rate of Rs. 5 per 1,000 cubic feet of firewood stacked.

(ii) Deputy Commissioners, Deputy Conservators of Forests, subject to the control of the Deputy Commissioner, and any officer specially empowered in this behalf by the Deputy Commissioner, may grant free passes for firewood to be burnt in the manufacture of bricks for pagodas and other religious buildings, or wells and other works of public utility.

FORM XV.—Prepaid License for Firewood.

LICENSE to cut, saw, convert, or remove cubic feet of firewood
during the period from the to the has been granted
under the Lower Burma Forest Rule to on payment
of Rs. being at the rate of Rs. 5 per 1,000 cubic feet of
firewood stacked, subject to the following conditions:—

(i) that this license is not transferable ;
 (ii) that this license does not exempt the holder from the payment of duty on firewood brought into Rangoon, Pegu, Prome, Paungdè, Shwedaung, Yandon, Henzada, Thyetmyo, Toungoo, Shwegyin, Moulmein, Tavoy, Mergui, on that part of Bassein which lies to the east of the Ngawun.

Breach of condition (i) of this license will render the licensee liable to forfeiture and the holder thereof to the punishment provided in the Forest Rules.

No. 430.—In exercise of the power conferred by section 43 (f) of the Lower Burma Forest Act, 1881, the Chief Commissioner makes the following addition to Rule 17 of the rules published in this department Notification No. 11, dated the 10th January 1888. This addition shall come into force from the 1st January 1893 :—

All firewood in respect of which there is reason to believe that any money is payable to Government may be stopped and examined by a Forest Officer anywhere at a landing-place or on a land route prescribed under Rule 8, proviso (3) (ii).

No. 431.—In exercise of the power conferred by sections 37 and 43 (a) of the Burma Forest Act, 1881, the Chief Commissioner makes the following rules for the Arakan division concerning the levy of a duty on firewood and the protection of shade trees on the banks of streams and sides of roads. These rules shall be read with the rules published in Revenue Department Notification No. 12, dated the 10th January 1888, and shall come into force from the 1st January 1893 :—

8. (i) On all firewood brought to Akyab there shall be levied the following fees :—

	Rs.	A.	A.
On firewood not exceeding 6 feet in length and 2 feet in girth, per 1,000 billets	10	0	0
On firewood not exceeding 4 feet 6 inches in length and 2 feet in girth, per 1,000 billets	8	0	0
On firewood not exceeding 4 feet 6 inches in length and 1 foot in girth, per 1,000 billets	2	8	0
On firewood not exceeding 3 feet in length and 1 foot in girth, per 1,000 billets	1	0	0
On firewood, small, in bundles of 10, not exceeding 1 foot in length, per 1 000 bundles	1	0	0

Or, at the option of the person paying the fees in the case of firewood brought in split and stacked, the following fees :—

	Rs.	A.	P.
For a stack 6' x 6' x 6'	1	4	0
For a stack 6' x 5' x 3'	0	8	0

Or, at the option of the person paying the fees, at the rate of Rs. 6 per stack of 1,000 cubic feet.

(ii) The fees prescribed in the foregoing clause shall be paid at one or other of the following landing-places :—

(1) The bank of the Satyogya creek between Kathlywa stream and Piligaung road.

(2) The bank of the Kaladan river from Paikseik or Jhallia creek to Monastery road.

(iii) No firewood shall be removed from any of the places referred to in clause (ii) until the fees payable in respect thereof as prescribed in clause (i) shall have been paid.

(iv) Notwithstanding the provisions of clauses (i), (ii) and (iii) above, no fees shall be levied on head-loads of firewood brought by women into Akyab.

9. A fee at the rate of Rs. 6 per 1,000 cubic feet shall be paid on all firewood, being the produce of land at the disposal of Government, used by steamers, launches, railways, or brickfields in the Arakan division. Such fee shall be paid before the firewood is utilized. Consumers may, subject to the sanction of the Commissioner, take out prepaid licenses in the form of License Form III attached to these rules for the total quantity of firewood to be consumed during any fixed period not exceeding one year. The fee for prepaid licenses shall be calculated at the rate of Rs. 5 per 1,000 cubic feet of firewood stacked.

10. Deputy Commissioners, and any officer specially empowered in this behalf by the Deputy Commissioner, may grant free passes for firewood to be burnt in the manufacture of bricks for pagodas and other religious buildings, or wells and other works of public utility.

11. No person shall cut trees within two chains of the banks of any stream or of the outer edge of the berm of any public road to which the Deputy Commissioner of the district in which the stream or road is situated may by public notice declare this rule to apply. The notices published under this rule shall specify the points on the stream or road referred to between which the cutting of trees is prohibited, and shall be served on the headmen of all villages near and posted up at conspicuous places in such villages and along the banks of the stream or along the road. The Deputy Commissioner may cancel or vary by publication in similar manner any notices issued under this rule.

10. Any person infringing Rule 8 or Rule 9 or Rule 11 shall be punishable with imprisonment for a term which may extend to six months, or with fine which may extend to Rs. 500, or with both.'

FORM III.—*Prepaid License for Firewood.*

LICENSE to cut, saw, convert, or remove cubic feet of firewood during the period from the to the has been granted under the Arakan Forest Rules to on payment of Rs. being at the rate of Rs. 5 per 1,000 cubic feet of firewood stacked, subject to the following conditions:—

- (i) that this license is not transferable;
- (ii) that this license does not exempt the holder from the payment of duty on firewood brought into Akyab.

Breach of condition (i) of this license will render the license liable to forfeiture and the holder thereof to the punishment provided in Rule 10 of the Arakan Forest Rules.

7th December, 1892.—No. 436.—The following transfers are ordered in the Forest Department:—

Mr. H. N. Thompson, Assistant Conservator of Forests, from Monywa to the charge of the Minguin sub-division of the Lower Chindwin division.

Mr. H. H. Forteach, Assistant Conservator of Forests, from Kindat to the charge of the Paungbyin sub-division of the Upper Chindwin division.

8th December, 1892.—No. 437.—Mr. R. F. Lewis, Extra Assistant Conservator of Forests, is transferred from the Pyinmana Forest division to the charge of the Ruby Mines sub-division of the Katha Forest division.

No. 439.—Under the provisions of section 4, sub-section (2), of the Upper Burma Forest Regulation, 1887, the Chief Commissioner appoints the Forest Officer in charge of the Bhamo Forest division to be the Forest Officer to assist the Forest Settlement Officer in the enquiry ordered in this department Notification No. 168, dated the 2nd October, 1890.

No. 300.—At the departmental examinations held at Bassein, Theyetmyo, Moulmein, Tayoy, Shwegyin, Toungoo, Mandalay, Bhamo, Katha, Mógok, Monywa, Ye-u, Minbu, Myingyan, Yamethin, Lashio, and Taunggyi (Southern Shan States) on the 7th and 8th November, 1892, the following officers passed in Burmese by the standards specified :—

Higher Standard.

Mr. H. N. Thompson, Assistant Conservator of Forests.

Mr. H. H. Forteach, Assistant Conservator of Forests.

Lower Standard.

Mr. A. M. Burn-Murdoch, Assistant Conservator of Forests,—
with credit.

Mr. M. Kavanagh, Extra Assistant Conservator of Forests,—
with credit.

9th December, 1892.—No. 14.—With reference to Revenue Department Notifications Nos. 362 and 363 (Forests), dated the 19th October, 1892, Mr. D. L. Richardson, Myook, reported his arrival at Katha for forest settlement duty on the forenoon of the 24th November, 1892.

No 15.—With reference to Revenue Department Notification No. 391, (Forests), dated the 3rd November, 1892, Mr. R. C. Dun, Assistant Conservator of Forests, reported his arrival in Katha on the forenoon of the 29th November, 1892.

13th December, 1892.—No. 451.—Under the provisions of Article 291 of the Civil Service Regulations, Mr. C. Ingram, Extra Assistant Conservator of Forests, is granted privilege leave for three months with effect from the date on which he may avail himself of it.

No. 452.—Under the provisions of Article 340 (b) of the Civil Service Regulations, furlough for four days is granted to Mr. H. Slade, Deputy Conservator of Forests, in extension of the furlough for 15 months granted to him in Revenue Department Notification No. 53 (Forests), dated the 12th March, 1891, and the extension thereof for three months granted to him by the Secretary of State for India.

15th December, 1892.—No. 307.—At the departmental examination held at Moulmein on the 7th November, 1892, the following officer passed the examination in Forest Procedure and Accounts for Forest Officers prescribed in Chapter IV of the Departmental Examination Rules :—

Mr. P. W. Healy, Extra Assistant Conservator of Forests.

20th December, 1892.—No. 460.—Mr. G. R. Long, Assistant Conservator of Forests, is transferred from Myanaung to the charge of the South Tenasserim Forest Division.

21st December, 1892.—No. 461.—The following alteration of rank is ordered in the Forest Department :—

With effect from the 2nd August 1892, consequent on the return of Mr. H. B. Ward from privilege leave :

Mr. C. H. Hobart-Hampden, Deputy Conservator, 4th (officialising 2nd) grade, to officiate as Deputy Conservator, 3rd grade.

No. 462.—The following temporary promotion is ordered in the Forest Department, with effect from the 7th November, 1892 :—

Mr. J. Messer, Assistant Conservator of Forests, 2nd grade, to officiate as Assistant Conservator, 1st grade.

22nd December, 1892.—No. 463.—The Chief Commissioner appoints Lieutenant H. N. Warde, Assistant Commissioner, to succeed the Subdivisional Officer, Yawdwin, as Forest Settlement Officer for the purpose of the enquiry ordered in this department Notification No. 244 dated the 19th August, 1892.

No. 464.—Mr. J. M. T. George, Assistant Commissioner, is appointed to be a Settlement officer in the Sagaing district.

20th December, 1892.—No. 16.—Mr. W. A. Hearsey, Extra Assistant Conservator of Forests, reported this return from the privilege leave granted to him in Revenue Department Notification No. 215, Forests, of the 29th September 1892, on the forenoon of the 1st December 1892.

10.—HYDERABAD RESIDENCY GAZETTE.

23rd November, 1892.—No. 354.—The Resident is pleased to invest the below mentioned Forest Officers in Berar with the powers described in section 36 (a), (b), (c), (d), (f), (g), and (h), of the Berar Forest Law, 1886 :—

Mr. G. F. Prevost, Deputy Conservator of Forests.

Mr. E. M. Coventry, Assistant Conservator of Forests.

Mr. Mansukh Rai, Extra Assistant Conservator of Forests.

Mr. C. Haldane, Extra Assistant Conservator of Forests.

11.—MYSORE GAZETTE.

16th December, 1892.—No. 8627. Mr. B. Srinivasa Rao, Sub-Assistant Conservator of Forests, reported himself for duty in the Kolar District on the forenoon of the 15th November, 1892.

8th December, 1892.—No. 8043—G. 1956-92.—Mr. S. A. Bapu Rao assumed charge of the Office of the Assistant Conservator of Forests, Bangalore, on the 11th August 1892.

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VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

2.—MADRAS GAZETTE.

22nd December, 1892.—No. 2.—Mr. H. McIntosh, Assistant Conservator of Forests, Second grade, to act as District Forest Officer of Cuddapah during the absence of Mr. F. A. Lodge on leave, or until further orders

28rd January, 1893.—No. 25.—

NAME.	Present grade.	Grade to which promoted.	Nature of promotion.
Mr. T. G. A. Gaudoin	Sub-Assistant Conservator of Forests, 2nd Grade.	Extra Assistant Conservator of Forests, 4th Grade.	Permanent.

3.—BOMBAY GAZETTE.

3rd January, 1893.—No. 26.—Hari Bhau Ubha, inhabitant of Mohadi in the Ahmednagar District and late a forest guard in the Igatpuri Range of the Nalik Forest Division, having been convicted under Section 161 of the Indian Penal Code, is hereby declared incapable of serving Government again in any capacity.

4th January, 1893.—No. 74.—His Excellency the Governor in Council is pleased to appoint—

Mr. G. P. Millett to be Divisional Forest Officer, North Thana ;

Mr. C. Greathead to be Divisional Forest Officer, South Thana ;

Mr. A. C. Robinson, L. C. E., to be Extra Assistant Conservator of Forests, Southern Circle.

9th January, 1893.—Mr. L. D. Joshi, Extra Assistant Conservator of Forests, delivered over charge of the Sub-division Office, Satara, to Mr. B. M. Kharkar, Huzur Deputy Collector, Satara, on the afternoon of the 3rd December, 1892, and received charge of the Sub-Division Office, East Khandesh, from Mr. B. H. Dalal, Extra Assistant Conservator of Forests, on the 15th idem, before office hours.

2 Messrs. G. S. Hinge and B. H. Dalal, Extra Assistant Conservators of Forests, respectively delivered over and received charge of the West Khandesh Sub-Division Forest Office on the afternoon of the 17th December, 1892.

3. Mr. B. M. Kharkar, Huzur Deputy Collector, Satara, delivered over and Mr. G. S. Hinge, Extra Assistant Conservator of Forests, received charge of, the Satara Sub-Division Forest Office on the forenoon of the 20th December, 1892.

17th January, 1893.—Mr. G. P. Millett, Deputy Conservator of Forests, Fourth Grade, and Mr. C. Greatheed, Deputy Conservator of Forests, Third Grade, respectively delivered over and received charge of the South Thana Forest Division on the afternoon of the 10th January, 1893.

4.—BENGAL GAZETTE.

3rd January, 1893.—No. 13.—Mr. C. S. Murray. C. I. E., Assistant Commissioner, Chittagong Hill Tracts, was in charge of the Chittagong Forest Division, from the afternoon of the 10th July, 1892, to the afternoon of the 26th August 1892, when he was relieved by Mr. C. G. D. Fordyce, Officiating Deputy Conservator of Forests, second grade.

24th January, 1893.—No. 363.—Mr. A. H. Mee, Officiating Extra Assistant Conservator of Forests, 4th grade, is confirmed in that appointment, with effect from the 28th October, 1892.

24th January, 1893.—No. 391.—Mr. R. Quinnell, Extra Assistant Conservator of Forests, 1st grade, in charge of the Palamau Forest Division, was reduced to the 2nd grade of Extra Assistant Conservators for a period of three months, with effect from the 22nd June, 1892.

5.—N. W. P. AND OUDH GAZETTE.

CORRIGENDA.

24th January, 1893.—No. 478A-10.—For rule 4 of Notification No. 391, dated 28th February 1880, substitute the following :—

“The Collector of Bijnor is appointed to be Forest Officer within the limits of his district, and to exercise the powers of a Conservator of Forests in respect of those forests which are not under the immediate control of a Divisional Officer of the Forest Department.”

In Notification No. 302, dated 28th February, 1880, omit the words “the Deputy Commissioner of Jhansi, the Deputy Commissioner of Lalitpur.”

In rule 5 of Notification No. 1004, dated 2nd November 1880, omit the words “the Deputy Commissioner of Lalitpur.”

6.—PUNJAB GAZETTE.

16th January, 1893.—No. 31.—Messrs. G. G. Minniken and L. Gisborne Smith, Deputy Conservators of Forests, respectively made over and received charge of the Bashahr Forest Division on the forenoon of 10th January 1893 consequent on the former's departure on the privilege leave for one month and ten days granted to him in Punjab Government Notification No. 595, dated 24th December, 1892.

17th January, 1893.—No. 36.—Under the provisions of Section 2 of the Indian Forest Act, VII of 1878, the Hon'ble the Lieutenant-Governor is pleased to appoint Captain J. S. E. Western, 1st Punjab Cavalry, to be a Forest Officer in respect of the Bandan Rakh at Dera Ismail Khan.

19th January, 1893.—No. 44.—Babu Ladha Singh and Mr. C. F. Rossiter, Extra Assistant Conservators of Forests, respectively made over and received charge of, the Montgomery Forest Division, on the forenoon of 6th January 1893, consequent on return of the latter from privilege leave.

24th January, 1893.—No. 57.—Babu Ladha Singh, Extra Assistant Conservator of Forests, has been attached to the Mooltan Forest Division with effect from the forenoon of the 10th January 1893.

7.—CENTRAL PROVINCES GAZETTE.

4th January, 1893.—No. 47.—The twelve months' leave on medical certificate granted to Mr F. S. Barker, Deputy Conservator of Forests, under Article 343 of the Civil Service Regulations, in General Department Notification No 8752, dated the 23rd December 1891, is commuted into furlough without medical certificate under Article 340 (b) of the Civil Service Regulations.

Notification No. 8752, dated the 23rd December 1891, is hereby cancelled.

8.—BURMA GAZETTE.

29th December, 1892.—No. 466.—Mr. Frederick Ryan, who has been appointed on probation an Extra Assistant Conservator of Forests in this province, reported his arrival in Rangoon on the afternoon of the 19th December, 1892.

Mr. Ryan is posted to the Myanaung Subdivision of the Western Forest Division, Pegu Circle.

17th December, 1892.—No. 17. With reference to Revenue Department Notification No. 437 (Forests), dated the 8th December, 1892, Mr. R. F. Lewis, Extra Assistant Conservator of Forests, assumed charge of the Rubi Mines Subdivision of the Katha Forest Division on the forenoon of the 23rd November, 1892.

6th January, 1893.—No. 3.—In exercise of the power conferred by section 3 of the Burma Forest Act, 1881, and section 2 of the Upper Burma Forest Regulation, 1887, respectively, and in supersession of this department Notifications Nos. 110 and 111 (Forests), dated the 28th March, 1892, the Chief Commissioner appoints the following Extra Assistant Conservators of Forests to discharge the functions of a Forest Officer, and to exercise all the powers conferred on Sub-Assistant Conservators by the rules hitherto made under the enactments in question :—

Mr. C. Ingram.	
Mr. J. Ailmark.	
Maung Kalè.	
Mr. C. W. Allan.	
Mr. D. L. K. Calderwood.	
Mr. W. J. Lane-Ryan.	
Mr. E. B. Powell.	

Mr. W. A. Hearsey.
Mr. R. F. Lewis.
Mr. Maung Wè.
Mr. P. W. Healy.
Mr. M. Kavanagh.
Mr. C. W. B. Anderson.
Mr. Frederick Ryan.

27th December, 1892.—No. 1.—With reference to the Revenue Department Notifications Nos. 343 to 347 (Forests), dated the 19th

October 1892, Lieutenant H. N. Warde, Assistant Commissioner, reported his arrival at Pakôkku for forest settlement duty on the afternoon of the 29th November 1892.

9th January, 1892.—No. 1.—With reference to Revenue Department Notification No. 460F., dated the 20th December 1892, Mr. G. R. Long, Assistant Conservator of Forests, relinquished charge of the Myanaung subdivision on the afternoon of the 18th ultimo.

10th January, 1893.—No. 1.—Mr. C. Ingram, Extra Assistant Conservator of Forests, made over, and Mr. G. R. Long, Assistant Conservator of Forests, received charge of, the South Tenasserim Division on the afternoon of the 30th December 1892.

No. 2.—Mr. C. Ingram, Extra Assistant Conservator of Forests, availed himself of the three months' privilege leave granted in Notification No. 451 (Forests), dated the 13th December 1892, on the 31st December 1892.

20th January, 1893.—No. 25.—Mr. D. L. K. Calderwood, Extra Assistant Conservator of Forests, is transferred from Mandalay to the Lower Chindwin Forest Division.

20th January, 1893.—No. 26.—Mr. M. Kavanagh, Extra Assistant Conservator of Forests, is transferred from Alôn to the Mandalay Forest Division.

17th January, 1893.—No. 2.—With reference to Revenue Department Notification No. 466, dated the 9th December 1892, Mr. F. Ryan, Probationary Extra Assistant Conservator of Forests, assumed charge of the Myanaung subdivision of the Western Division on the forenoon of the 4th January 1893.

9.—ASSAM GAZETTE.

21st January, 1893.—No. 396J.—Privilege leave of absence for two days, under article 291 of the Civil Service Regulations, is granted to Babu Jogesvar Sur, Extra Assistant Conservator of Forests, Assam, in extension of the leave granted in Notification No. 8379G., dated the 15th September 1892.

10.—HYDERABAD RESIDENCY GAZETTE.

10th December, 1892.—No. 371.—The Resident is pleased to declare that Mr. Sreenivasuloo Naidu, an Extra Assistant Conservator of Forests in Berar, has passed the examination prescribed for Forest Officers in the Hyderabad Assigned Districts in Marathi by the Lower Standard.

VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—GAZETTE OF INDIA

27th February, 1893.—No. 63.—Mr. E. M. Buchanan, Extra Assistant Conservator of Forests, Port Blair, is appointed to be an Assistant Superintendent in the Settlement so long as he holds his present office, or until further orders.

27th February, 1893.—No. 203-F.—The following transfers have been made in the interests of the public service:—

Mr. E. G. Chester, Deputy Conservator of Forests, 2nd grade,—from the Andamans to Bengal.

Mr. C. G. D. Fordyce, Deputy Conservator, 3rd grade,—from Bengal to the Andamans.

27th February, 1893.—No. 206-F.—Privilege leave for three months, under articles 277 and 291 of the Civil Service Regulations, is granted to Mr. E. P. Dansey, Conservator of Forests, 2nd grade, Bengal, with effect from the 15th April, 1893, or the subsequent date on which he may avail himself of it.

Mr. E. G. Chester, Deputy Conservator, 2nd grade, is appointed to officiate as Conservator of Forests, Bengal, during Mr. Dansey's absence, or until further orders.

2.—MADRAS GAZETTE.

26th January, 1893.—No. 41.—Under section 32 of the Madras Forest Act. (V of 1882), His Excellency the Governor in Council is pleased to declare that the said Act and the rules framed thereunder shall be applicable to the Saptur estate in the Madura district.

1st February, 1893.—The following candidates have passed the Departmental Tests held in the month of January, 1893:—

No.	Name.	Designation.	Tests passed.
1	S. Eggia Narayan Sastri...	Forester, Cuddapah ...	In Code & Accts.
2	Mahomed Abdul Hakim...	Do. Nellore ...	Do.
3	N.S. Duraiswami Aiyar...	Acting Head Clerk, District Forest office, North Arcot	Do.
4	Govindarajulu Chetty ...	Forester, North Arcot ...	In Law.
5	Mir Jafir Ali Kirmondi Saib.	Do. South Arcot ...	In Code and Accounts.
6	Mr. Evers ...	Do. Salem ...	In Law.
7	R. Runga Row ...	Clerk, Salem ...	Do.
8	Panchapakasa Aiyar ...	Forester, Trichinopoly ...	In Code and Accounts & Law.

13th February, 1893.—No. 72.—Mr. W. Carroll, District Forest Officer Chingleput, is granted privilege leave for two months, with effect from or after 15th February, 1893, under article 291 of the Civil Service Regulations.

18th February, 1893.—No. 73.—M. R. Ry. V. Alwar Chetti Garu, Extra Assistant Conservator of Forests, Second Grade, to act as District Forest Officer of Chingleput during the absence of Mr. W. Carroll on leave, or until further orders.

3.—BOMBAY GAZETTE.

25th January, 1893.—Mr. A. C. Robinson, L. C. E., Extra Assistant Conservator of Forests substantive *pro-tem*. Third Grade and South Sub-Division Forest Officer, North Thàna, and Mr. G. P. Millett, Deputy Conservator of Forests, Fourth Grade, and Divisional Forest Officer, North Thàna, respectively delivered over and received charge of the South Sub-Division Forest Office, North Thàna, on the afternoon of the 14th January, 1893.

25th January, 1893.—Mr. H. Murray, Deputy Conservator of Forests, who was appointed Divisional Forest Officer, Working Plans, in Government Notification No. 8697, dated 4th November 1892, assumed charge of the office on the afternoon of the 11th idem.

Mr. H. Mainwaring, Deputy Conservator, received charge of the above office from Mr. Murray on the forenoon of the 13th December 1892.

7th February, 1893.—No. 1078.—His Excellency the Governor in Council is pleased to confer upon Mr. B. G. Deshpande, Extra Assistant Conservator of Forests and Divisional Forest Officer, Ratnagiri, the powers mentioned in section 67 of the Indian Forest Act, No. VII of 1878, as amended by Section 13 of Act No. V of 1890.

4th February, 1893.—Mr. T. B. Fry, Deputy Conservator of Forests, Second Grade, joined the Northern Circle as Divisional Forest Officer, Working Plans, as directed in Government Resolution No. 10144 of 28th December 1892, Revenue Department, on 13th January 1893.

15th February, 1893.—No. 634.—Mr. J. L. L. MacGregor, Conservator of Forests, S. C., has been allowed by Her Majesty's Secretary of State for India to return to duty within the period of his leave.

17th February, 1892.—No. 659.—Mr. L. S. Osmaston, Assistant Conservator of Forests, has been allowed by Her Majesty's Secretary of State for India an extension of leave on medical certificate for four months and extraordinary leave on medical certificate without pay for two months.

4.—BENGAL GAZETTE.

9th February, 1893.—No. 704.—Mr. W. M. Green, Deputy Conservator of Forests and Personal Assistant to the Conservator of Forests Bengal, is granted furlough for seven months, under article 371 (a) of the Civil Service Regulations, with effect from the 1st April 1893 or any subsequent date on which he may avail himself of it.

20th February, 1893.—No. 859.—Mr. E. G. Chester, Deputy Conservator of Forests 2nd grade, is on his transfer to Bengal from the Andamans, attached to the Direction Division for special duty in connection with the preparation of a working plan for the Singhbhum Reserved forests.

21st February, 1893.—No. 889.—In continuation of the Notification, No 4212 For., dated the 5th December, 1892, published at page 1076, Part I of the *Calcutta Gazette* of the 7th idem, the following, further reversions are ordered in the Upper Controlling Staff of the Bengal Forest Department, with effect from the 3rd November, 1892, in consequence of the return of Mr. H. H. Davis, Deputy Conservator of Forests, 1st grade, from leave:—

1. Mr. R. L. Heinig, Officiating Deputy Conservator of Forests, third grade, to revert to the fourth grade of Deputy Conservators.

2. Mr. W. H. Lovegrove, Officiating Deputy Conservator of Forests, fourth grade, to revert to the first grade of Assistant Conservators of Forests.

21st February, 1893.—No. 890.—Consequent on the return to duty of Mr. C. G. D. Fordyce, Deputy Conservator of Forests, third grade, the following reversions of officers of the Upper Controlling Staff of the Bengal Forest Department are ordered with effect from the 14th December, 1892:—

1. Mr. C. A. G. Lillingston, Officiating Deputy Conservator, third grade, to revert to his substantive appointment of Deputy Conservator, fourth grade.

2. Mr. H. H. Haines, Officiating Deputy Conservator, fourth grade, to revert to his substantive appointment of Assistant Conservator, first grade.

5.—N. W. P. AND OUDH GAZETTE.

6th February, 1893.—No. 114—XIV. 538A.—In the rules on page 33, Part XIV, Vol. II of the Manual of Government Orders, add after the words "The Forest Officer in charge of the Ganges Division" to—

The Forest Officer in charge of the Bundelkhand Division to	{	The Collectors of Jhānsi and Banda, respectively, in respect of forests in those districts.
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10th February, 1893.—No. 387. II.—233C.—Mr. Keshava Nand, Extra Assistant Conservator of Forests, was attached to the Kheri Forest Division, Oudh Circle, as Working Plans Officer from the 15th January, to the 17th September, 1892, both days inclusive.

10th February, 1893.—No. 112 VII.—455B-2.—The Hon'ble the Lieutenant-Governor and Chief Commissioner is pleased to declare the undermentioned gentlemen to have passed the Departmental Examination of Junior Officers, held on the 24th of October 1892, and following days, in the subjects specified below:—

V. FOREST OFFICERS.

Forest Law.

By Higher Standard.

Mr. F. A. Leete.

Land Revenue Systems.

By Higher Standard.

Mr. F. A. Leete.

Mr. J. C. Tulloch.

Accounts.

By Higher Standard.

Mr. F. A. Leete.

Mr. J. C. Tulloch.

24th February, 1893.—No. 509.—II. 349C.—Mr. F. A. Leete, Assistant Conservator of Forests, on special duty in the Direction Division of the Central Circle, is attached to the Kumaun Forest Division of the same circle as Working-Plans Officer, with effect from the 18th November 1892.

24th February, 1893.—No. 520—622B.—The undermentioned officer has been granted by Her Majesty's Secretary of State for India extension of leave:—

Name.	Service.	Appointment.	Period and nature of leave.
Mr. E. A. Down ...	Uncovenanted.	Deputy Conservator of Forests	Five months on medical certificate.

6.—PUNJAB GAZETTE.

28th January 1893.—No. 69.—The following addition is made in Punjab Government Notification No. 377, dated 30th October 1891:—

Mr. A. M. Reuther, Deputy Conservator of Forests, 4th Grade, and Officiating Deputy Conservator of Forests, 3rd Grade, to be Deputy Conservator of Forests, 3rd Grade substantive provisional.

28th January 1893.—No. 70.—The following addition is made in Punjab Government Notification No. 380 of 30th October 1891:—

Mr. A. M. Reuther, Deputy Conservator of Forests, 3rd Grade, substantive provisional, to be Officiating Deputy Conservator of Forests, 3rd Grade.

28th January 1893.—No. 71.—The following addition is made in Punjab Government Notification 382, dated 30th October 1891:—

M. A. M. Reuther, Officiating Deputy Conservator of Forests, 3rd Grade, to be Deputy Conservator of Forests, 3rd Grade, substantive provisional.

28th January 1893.—No. 72.—In Punjab Government Notification No. 277 of 4th June 1892, omit the following entry:—

(3) Mr. A. M. Reuther, Officiating Deputy Conservator of Forests, 3rd Grade, to be Deputy Conservator of Forests, 3rd Grade, sub *pro tem*.

30th January 1893.—No. 77.—Consequent on the departure of Mr. G. F. Prevost, Officiating Deputy Conservator of Forests, 2nd Grade on special leave for six months, the following promotions shall have effect from the 17th June 1892:—

Mr. W. King, Deputy Conservator of Forests, 3rd Grade, to officiate as Deputy Conservator of Forests, 2nd Grade.

Mr. G. F. Taylor, Deputy Conservator of Forests, 4th Grade, to officiate as Deputy Conservator of Forests, 3rd Grade.

Mr. A. V. Munro, Assistant Conservator of Forests, 1st Grade, to officiate as Deputy Conservator of Forests, 4th Grade.

30th January 1893.—No. 78.—Mr. M. Muttannah, Assistant Conservator of Forests, 1st Grade, substantive (provisional), is transferred to the Provincial Branch of the Upper Controlling Staff, and appointed as Extra Assistant Conservator of Forests, 1st Grade, with effect from the 26th February 1891.

Consequent on the above, the following promotion will take place with effect from the 18th June 1892.

Mr. P. H. Clutterbuck, Officiating Assistant Conservator of Forests 1st Grade, to be Assistant Conservator of Forests, 1st Grade, substantive (provisional.)

30th January 1893.—No. 79.—Consequent on the departure of Mr. A. V. Munro, Officiating Deputy Conservator of Forests, 4th Grade, on privilege leave for three months, the following promotion shall have effect from the 28th June 1892.

Mr. A. W. Blunt, Assistant Conservator of Forests, 1st Grade, substantive (provisional), to officiate in addition as Deputy Conservator of Forests, 4th Grade.

30th January 1893.—No. 80.—Consequent on the departure of Mr. A. H. Moore, Officiating Deputy Conservator of Forests, 4th Grade, on furlough for one year, the following promotions shall have effect from the 2nd August 1892.

Mr. A. L. McIntire, Deputy Conservator of Forests, 4th Grade, to officiate as Deputy Conservator of Forests, 3rd Grade;

Mr. P. H. Clutterbuck, Assistant Conservator of Forests, 1st Grade, substantive (provisional), to officiate in addition as Deputy Conservator of Forests, 4th Grade.

7th February 1893.—No. 101.—Mr. G. S. Hart, Officiating Deputy Conservator of Forests, Punjab, is granted leave for 21 days, under Article 291 of the Civil Service Regulations, with effect from the 15th February 1893, or such subsequent date, as he may avail himself of it.

23rd February 1893.—No. 138.—Mr. A. V. Munro, Assistant Conservator of Forests, and Babu Ladha Singh, Extra Assistant Conservator of Forests, respectively made over and received charge of Mooltan Forest Division on the forenoon of 20th instant, consequent on the transfer of the former to Beluchistan.

7.—CENTRAL PROVINCES GAZETTE.

10th February 1893.—No. 773.—Mr. P. H. Clutterbuck, Assistant Conservator of Forests, reported his return, on the forenoon of the 12th ultimo, from the privilege leave granted to him by Notification No. 4373, dated the 14th November 1892.

Mr. Clutterbuck is attached as Working Plans Officer to the Southern Circle, and assumed charge of his duties on the forenoon of the 12th ultimo.

16th February 1893.—No. 908.—Consequent on the departure of Mr. G. F. Prevost, Officiating Deputy Conservator of Forests, 2nd Grade, on special leave for six months, the following promotions shall have effect from the 17th June 1892—

See Punjab Gazette Notification No. 77, dated 30th January 1893—

16th February 1893.—No. 909.—Mr. M. Muttannab, Assistant Conservator of Forests, 1st Grade, substantive (provisional), is transferred to the Provincial Branch of the Upper Controlling Staff, and appointed as an Extra-Assistant Conservator of Forests, 1st Grade, with effect from the 26th February 1891.

See Punjab Gazette Notification No. 78, dated 30th January 1893—

16th February 1893.—No. 910.—Consequent on the departure of Mr. A. V. Munro, Officiating Deputy Conservator of Forests, 4th Grade, on privilege leave for three months, the following promotion shall have effect from the 28th June 1892 :—

See Punjab Gazette Notification No. 79, dated 30th January 1893—16th February 1893.—No. 911.—Consequent on the departure of Mr. H. Moore, Officiating Deputy Conservator of Forests, 3rd Grade, on furlough for one year, the following promotions shall have effect from the 2nd August 1892.

See Punjab Gazette Notification No. 80, dated 30th January 1893—20th February 1893.—No. 970.—Mr. F. S. Barker, Deputy Conservator of Forests, has been granted by Her Majesty's Secretary of State for India six months' leave on medical certificate, in extension of the twelve months' furlough granted to him by Notification No. 47, dated the 4th ultimo.

8.—BURMA GAZETTE.

8th February 1893.—No. 46.—Mr. M. Kavanagh, Extra-Assistant Conservator of Forests, 4th Grade, on probation, is confirmed in his appointment with effect from the 7th November 1892.

15th February 1893.—No. 55.—Mr. E. A. O'Brien, Officiating Deputy Conservator of Forests, was on special duty in the Katha Forest division from the 24th October to the 3rd November 1892 both inclusive.

22nd February 1893.—No. 60.—Under the provisions of section 4 (c) of the Upper Burma Forest Regulations, 1887, the Chief Commissioner appoints Mr. H. G. Sharpe, I.C.S., Assistant Commissioner, to succeed Lieutenant H. N. Warde, as Forest Settlement Officer in the cases of the proposed *North Yama Laungtaung*, and *Kunze* reserves referred to in this department, Notification No. 10 dated the 21st January 1892, No. 10 dated the 8th January 1891, and No. 11, dated the 8th January 1891, respectively.

23rd February 1893.—No. 66.—Mr. J. Messer, Assistant Conservator of Forests, is transferred from Rangoon to the Working Plans Division, Prome, with effect from the 3rd December 1892.

9.—ASSAM GAZETTE.

2nd February 1893.—No. 698.—Privilege leave of absence for one month, under article 291 of the Civil Service Regulations, is granted to Mr. H. G. Young, Deputy Conservator of Forests, in charge of Kamrup Forest Division, with effect from the 26th January 1893, or the subsequent date on which he may avail himself of it.

24th February 1893.—No. 1151.—Mr. A. M. Long, Assistant Conservator of Forests in charge of the Sibsagar Forest Division, is transferred temporarily to the Kamrup Forest Division, of which he will hold charge during the absence on privilege leave of Mr. H. G. Young, or until further orders, with effect from the date of receiving charge.

24th February 1893.—No. 1152.—Mr. R. H. M. Ellis, Deputy Conservator of Forests in charge of the Lakhimpur Forest Division, is placed in charge of the Sibsagar Forest Division in addition to his own duties, until further orders.

11.—MYSORE GAZETTE.

24th January 1893.—No. 12786—G. 2703.—Under Article 171 of the Mysore Service Regulations, Mr. Sitarmaiya, Assistant Conservator of Forests, Mysore, was granted 3 days' casual leave of absence from the 5th December 1892.

VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

1—GAZETTE OF INDIA.

24th February, 1893.—No. 238F.—Special leave for three months, under article 348 of the Civil Service Regulations, is granted to Mr. R. H. C. Whittall, Conservator of Forests, 2nd grade, Punjab, with effect from 19th February, 1893.

Mr. C. F. Elliott, Deputy Conservator, 1st grade, Baluchistan, is temporarily transferred to the Punjab and appointed to officiate as Conservator, 3rd grade, in charge of the Punjab Forest Circle, with effect from the date on which he assumes charge of that appointment and until further orders.

Mr. J. H. Lacey, Deputy Conservator, 3rd grade, Punjab, is appointed to be in charge of the current duties of the Punjab Conservator's Office, in addition to his own duties, till Mr. Elliott assumes charge.

Mr. A. V. Monro, Officiating Deputy Conservator, 4th grade, Punjab, is transferred temporarily to Baluchistan, *vice* Mr. Elliott.

3rd March, 1893.—No. 238-F.—With reference to the Notification of this Department, No. 238-F. dated the 24th ultimo, Mr. Elliott assumed charge of the Office of Conservator of Forests, Punjab, on 27th February, 1893.

17th March, 1893.—No. 337-F.—With reference to the Notification of this Department, No. 238-F., dated the 24th ultimo, Mr. P. J. Carter, Conservator of Forests, 3rd grade, Pegu Circle, Burma, is appointed to officiate in the 2nd grade of Conservators during Mr. Whittall's absence on leave, or until further orders, with effect from 19th February, 1893.

No. 339 F.—Furlough for one year, under Article 340 (b) of the Civil Service Regulations, is granted to Mr. F. B. Dickinson, Officiating Conservator of Forests, Berar, with effect from 25th March, 1893, or the date on which he may be relieved of charge of the Berar Forest Circle.

2—MADRAS GAZETTE.

25th February, 1893.—K. Aswatham Naidu, D.D.M., Second-grade Forester, to be Fifth-grade Ranger from this date (temporary rank—Board's Proceedings, Forest No 1067, dated 6th October 1892) and transferred to Kistna.

26th February, 1893.—Mr. E. C. M. Mascarenhas, Ranger on Rs. 50, North Coimbatore District, is granted privilege leave for one month, under article 291 of the Civil Service Regulations, from 10th March, 1893.

6th March, 1893.—The following officers have passed the Departmental Examination held in January 1893 in Parts (a) and (b) of para 56 of the Forest Code:—

North Malabar Division	...	A. G. Macfarlane, Acting sub. <i>pro tem</i> . Forester on Rs. 40 (with credit).
South Malabar Division	...	K. Raghava Nair, Forester, on Rs. 20 (with credit).
Nilgiri District	...	M. Srinivasa Iyengar, Acting sub. <i>pro tem</i> . Forester on Rs. 30.
North Coimbatore Division	...	A. P. McKoy, Acting sub. <i>pro tem</i> . Forester on Rs. 30.
Tinnevely District	...	A. G. Jesudasan Pillai, Acting sub. <i>pro tem</i> . Forester on Rs. 20.

10th March, 1893.—No. 121.—Mr. A. W. C. Stanbrough, Acting Examiner of Forest Accounts, Madras, is granted privilege leave for three months, from or after 1st April, 1893, under article 291 of the Civil Service Regulations.

11th March, Privilege leave to M. R. Ry. Maduranayagam Pillai, Sub-Assistant Conservator, for three months, from 15th April 1893, under article 291 of the Civil Service Regulations.

18th March, Leave on medical certificate to C. Subramania Aiyar, Forest Ranger, Fifth Grade, North Arcot District, for two months, from date of relief, under article 369 of the Civil Service Regulations.

18th March, 1893.—Mr. R. W. Rouse, Acting sub. *pro tem.* Ranger on Rs. 50 in Madura, to revert to his substantive rank as Forester on Rs. 40, until further orders.

18th March, 1893.—Srinivasa Chamberlain, Forester on Rs. 40, South Coimbatore, to act Sub. *pro tem.* Ranger on Rs 50, until further orders.

3.—BOMBAY GAZETTE.

9th March, 1893.—Messrs. A. Lucas and C. G. Dodgson respectively delivered over and received charge of the Office of Forest Settlement Officer, Khandesh, on the 21st ultimo, in the forenoon.

18th March, 1893—No. 2031.—Mr. R. C. Wroughton, acting Conservator of Forests, Third Grade, is allowed furlough for one year from the 6th May 1893, or from such subsequent date as he may avail himself of it.

4.—BENGAL GAZETTE.

14th March, 1893.—No. 1255 —Mr C. C. Hatt, Assistant Conservator of Forests, 2nd grade, attached to the Darjeeling Forest Division, passed the Examination in Procedure and Accounts prescribed in section 78 of the Forest Department Code, on the 16th January 1893.

20th March, 1893.—No. 1378 —Mr. C. A. G. Lillingston, Deputy Conservator of Forests, in charge of the Chittagong Forest Division, is appointed to be Personal Assistant to the Conservator of Forests, Bengal, *vice* Mr W. M. Green, Deputy Conservator of Forests, proceeding on furlough.

Mr E. J. N. James, Extra-Assistant Conservator of Forests, third grade, attached to the Singhbhum Forest Division, is appointed to the charge of the Chittagong Forest Division, *vice* Mr. Lillingston.

Mr. F. Trafford, Assistant Conservator of Forests, attached to the Jalpaiguri Forest Division, is transferred to the Singhbhum Forest Division, *vice* Mr James.

25th March, 1893 —In continuation of the notification dated 13th December, 1892, it is hereby notified that the following officers passed in the subject and standard mentioned against their names at the half-yearly departmental examination of Assistant Magistrate and others held in October 1892.—

Forest Officer.

- Mr. E. E. Slane Hindustani, Higher Standard.

5.—N. W. P. AND OUDH GAZETTE.

16th March, 1893.—No. 669.—Mr. F. A. Leete, Assistant Conservator of Forests, on special duty as Working Plans Officer in the

Kumman Forest Division of the Central Circle, was transferred to the Direction Division of the same Circle, with effect from the 10th January, 1893.

No. 670.—Mr. F. A. Leete, Assistant Conservator of Forests, on special duty in the Direction Division of the Central Circle, is attached to the Garhwal Forest Division of the same Circle as Working Plans Officer, with effect from the 23rd February, 1893.

17th March, 1893.—No. 713.—With effect from the 28th November 1892, the date on which Mr. F. Beadon-Bryant returned from furlough and assumed charge of his duties—

Mr. B. A. Rebsch, Officiating Deputy Conservator of Forests, 3rd grade, to revert to Deputy Conservator of Forests, 4th grade ;

Mr. A. P. Grenfell, Officiating Deputy Conservator of Forests, 4th grade, to revert to Assistant Conservator of Forests, 1st grade.

22nd March, 1893.—No. 765.—Mr. Keshavanand, Extra Assistant Conservator of Forests, was on special duty in the Kheri Forest Division, from the 18th September to the 19th October 1892, both days inclusive.

6.—PUNJAB GAZETTE.

3rd March 1893.—No. 156.—Mr. G. S. Hart, Officiating Deputy Conservator of Forests, and Lala Jowala Parshad, Extra Assistant Conservator of Forests, respectively made over and received charge of the Umballa Forest Division on the afternoon of the 19th February 1893 consequent on the departure of the former on privilege leave for 21 days granted him in *Punjab Government Gazette* Notification No. 101 of the 7th February 1893.

8th March 1893.—No. 164.—Mr. A. M. Reuther, Deputy Conservator of Forests, is granted nine months furlough, under Article 371 (a) of the Civil Service Regulations, with effect from the 11th March 1893 or such subsequent date as he may avail himself of it.

Mr. Reuther made over charge of the Hazara Forest Division to Sadhu Singh, Extra Assistant Conservator of Forests, on the afternoon of the 25th February 1893.

No. 168.—Messrs L. Gisborne Smith and G. G. Minniken, Deputy Conservators of Forests respectively made over and received charge of the Bahahar Forest Division on the forenoon of the 20th February 1893 consequent on the latter's return from the privilege leave granted him in *Punjab Government Gazette* Notification No. 31, dated 16th January 1893.

10th March 1893.—No. 181.—In continuation of Notification No. 564, dated the 9th December 1892, it is notified that the Lieutenant-Governor is pleased to appoint Babu Daulat Ram to be an Extra Assistant Conservator of Forests of the 4th Grade, with effect from the forenoon of the 18th February 1893, and to rank him immediately above Babu Sadhu Singh.

Babu Daulat Ram, on return from Jodhpur, reported his arrival at Lahore on the forenoon of the 18th February 1893, and was transferred thence to the Chenab Forest Division, of which he assumed charge on the afternoon of the 23rd February 1893, relieving Mr. R. J. P. Pinder, Deputy Conservator of Forests.

11th March 1893.—No. 184.—Messrs J. H. Lace and L. Gisborne Smith, Deputy Conservators of Forests, respectively made over and received charge of the Direction Division and the duties of Personal Assistant to the Conservator of Forests, Punjab, on the forenoon of the 3rd March 1893.

No. 188.—Mr. L. Gisborne Smith, Deputy Conservator of Forests, was attached to the Direction Division from the forenoon of 19th October 1892 to the afternoon of 7th January 1893, and again from the forenoon of the 23rd February to the afternoon of the 2nd March 1893.

No. 192.—Mr. J. H. Lace, Deputy Conservator of Forests, Punjab, is granted furlough for 18 months, under article 340 (b) of the Civil Service Regulation, with effect from the 1st March 1893, or such subsequent date from which he may avail himself of it.

13th March 1893.—No. 198.—The Lieutenant-Governor is pleased, under Section 75 of Act VII of 1878 (The Indian Forest Act) to prescribe that the following rule shall be substituted for Rule 2, which is hereby cancelled, in the Rules published in Punjab Government Notification No. 533 F., dated 8th December 1879 :—

Rule 2.—The Forest Officers mentioned in the first column of the following schedule shall exercise the powers under the sections of the Act mentioned in the second column of the same opposite each class of officers respectively :—

Class of Officers empowered	Section of the Act under which powers are given	Brief description of nature of powers conferred.
I.—All Deputy Conservators, Assistant Conservators and Extra Assistant Conservators when in charge of Forest Divisions.	20	To publish translation of Notifications of reserved forests.
	25	To notify seasons during which the kindling, &c., of fire is not prohibited.
	45	To notify depôts for drift timber, &c.
	60	To direct release of property seized.
	82	To take possession of and sell forest produce for Government use.
II.—All Deputy Conservators, Assistant Conservators and Extra Assistant Conservators.	46	To issue notice to claimants of drift timber, &c.
	47	To decide claims to drift timber, &c.
	50	To receive payments on account of drift timber, &c.
III.—All Deputy Conservators, Assistant Conservators and Extra Assistant Conservators, Forest Rangers and Foresters when specially authorized in that behalf by the Conservator of Forests.	25	To permit acts otherwise prohibited in reserved forests.
	23	To permit acts otherwise prohibited in protected forests.

22nd March 1893.—No. 221.—Notification.—Mr. J. H. Lace, Deputy Conservator of Forests, relinquished charge of his duties as a

Working Plans Officer on the afternoon of the 11th March 1893 consequent on his departure on furlough for 18 months granted to him in Punjab Government Notification No. 192, dated 11th March 1893.

24th March 1893.—No. 228.—*Notification*.—Lala Jawala Parahad, Extra Assistant Conservator of Forests, and Mr G. S. Hart, Officiating Deputy Conservator of Forests, respectively, made over and received charge of the Umballa Forest Division on the forenoon of the 15th March 1893, consequent on the return of the latter from the privilege leave granted him in Punjab Government Notification No. 101 of the 7th February 1893.

7.—CENTRAL PROVINCES GAZETTE.

1st March 1893.—No. 1.—Under the authority conferred on him by Secretariat Notification No. 3555, dated the 12th June 1890, the Conservator of Forests, Northern Circle, Central Provinces, appoints Forest Ranger Mohan Lall in the Betul Forest Division and Forest Ranger Mahomed Yassin in the Nimar Forest Division to exercise the powers described in Section 67 of Act VII of 1878 (as amended by Act V of 1890).

14th March 1893.—No. 1270.—Consequent on Mr. V. S. Menzies, Assistant Conservator of Forests, being incapacitated for duty by illness, Mr. Chunder Kumar Chatterji, Extra-Assistant Conservator of Forests, is appointed to the charge of the Nagpur-Wardha Division, with effect from the afternoon of the 5th January 1893.

8.—BURMA GAZETTE.

25th February 1893.—No. 2.—With reference to Revenue Department Notification No. 26, dated the 24th January 1893, Mr. M. Kavanagh, Extra Assistant Conservator of Forests, made over, and Mr. T. H. Aplin, Deputy Conservator of Forests, assumed charge of, the Alon Revenue subdivision, Lower Chindwin Forest division, on the afternoon of the 21st February 1893, as a temporary measure in addition to his other duties.

23rd February 1893.—No. 3.—With reference to Revenue Department Notification No. 66, dated the 23rd instant, Mr. J. Messer, Assistant Conservator of Forests, relinquished charge of his duties as Personal Assistant to the Conservator of Forests, Pegu Circle, on the afternoon of the 2nd December 1892.

7th March 1893.—No. 77.—In exercise of the power conferred by section 34 of the Upper Burma Forest Regulation, 1887, the Chief Commissioner extends the provisions of Rule 16 (c) of the Upper Burma Forest Rules to the Upper and Lower Chindwin districts in so far as it refers to Pyinkado.

3rd March 1893.—No. 4.—In this office Notification No. 19, dated the 18th October 1892, for "12th instant" read "12th September"; and for "16th instant" read "16 September."

4th March 1893.—No. 1.—With reference to Revenue Department Notifications Nos. 25 and 26, dated Rangoon, the 24th January 1893, Mr. D. L. K. Calderwood and Mr. M. Kavanagh, Extra Assistant Conservators of Forests, respectively made over and received charge of the Maudalay Revenue Subdivision on the forenoon of the 1st March 1893.

14th March 1893—No. 3.—With reference to Revenue Department Notification No. 26, dated the 24th January 1893, and to this office Notification No. 13, dated the 24th February 1893, Mr. T. H. Aplin, Deputy Conservator of Forests, made over, and Mr. D. L. K. Calderwood, Extra Assistant Conservator of Forests, assumed charge of the Alou Revenue subdivision, Lower Chindwin division, on the afternoon of the 4th March 1893.

No. 89 Mr. E. B. Powell, Extra Assistant Conservator of Forests, 4th grade, on probation, is confirmed in his appointment with effect from the 7th November 1892.

No. 90 (Forests)—In this department Notification No. 64, dated the 29th April 1890, under the heading *Pyinmana district, for "Pyinmana" read "Kjedaunggan."*

16th March 1893.—No. 97.—The Chief Commissioner directs that, with effect from the 1st April 1893, that part of the Pakókku district which is at present included in the Lower Chindwin forest division shall form part of the Yaw forest division.

23rd March 1893.—No. 106.—The following temporary alterations of rank are ordered in the Forest Department, with effect from the 7th November 1892:—

Mr. H. N. Thompson, Assistant Conservator of Forests, 2nd grade, to officiate as Assistant Conservator, 1st grade.

Mr. H. H. Forteath, Assistant Conservator of Forests, 2nd grade, to officiate as Assistant Conservator, 1st grade.

No. 107.—The following posting and transfer are ordered in the Forest Department:—

Mr. C. Ingram, Extra Assistant Conservator of Forests, on his return from privilege leave, is posted to the charge of the Agency division, and Kado subdivision, Moulmain.

Mr. P. W. Healy, Extra Assistant Conservator, on being relieved by Mr. Ingram, is transferred to the charge of the Attaran subdivision of the Salween-Attaran Forest division.

9—ASSAM GAZETTE.

10th March 1893.—No. 1570J.—Mr. A. M. Long, Assistant Conservator of Forests, Kamrup Forest Division, on being relieved by Mr. H. G. Young, is placed in charge of the Sibsagar Forest Division.

22nd March 1893.—No. 2963J.—With effect from the 28th July 1892, in consequence of the departure on privilege leave of Mr. D. P. Copeland, Provisional Deputy Conservator of Forests, Second Grade,—

Mr. H. G. Young, Provisional Deputy Conservator, Third Grade, to officiate as Provisional Deputy Conservator, Second Grade.

Mr. T. J. Campbell, Deputy Conservator, Fourth Grade, to officiate as Provisional Deputy Conservator, Third Grade.

10.—HYDRABAD RESIDENCY GAZETTE.

2nd March 1893.—No. 62.—The designation of Sub-Assistant Conservator of Forests having been superseded by that of Extra Assistant Conservator, by the orders contained in the Circular No. 18-F., dated the 29th July 1891, of the Government of India in the Revenue and Agricultural Department, the Resident is pleased to direct that in the rules issued under the Berar Forest Law, 1886, and published in *Residency Orders* Notification Nos. 198 and 194, dated the 6th June 1892, for the words "Sub-Assistant Conservator" wherever they occur, the words "Extra Assistant Conservator" shall be read.

14th March 1893.—No. 79.—Mr. Sreenivasulu Naidu, Extra Assistant Conservator of Forests, has been transferred from Basim to Amraoti, and placed in charge of the Amraoti Forest Division.

11.—MYSORE GAZETTE.

22nd February 1893.—No. 14212—G. 3301.—Mr. Y. Sitaramaiya, B. A., Assistant Conservator of Forests, Mysore District, who was granted 10 days' casual leave in Notification No. 13584—G. 3138, dated 15th February 1893, having availed himself of only six days from the 9th to the 14th January 1893, the unexpired portion of the leave, viz., 4 days, is hereby cancelled,

19th March 1893.—No. 15353.—G. 3671.—Under Article 171 of the Mysore Service Regulations, Mr. B. Srinivasa Rao, Sub-Assistant Conservator of Forests, Kolar District, was granted 3 days' casual leave of absence, with effect from the 9th February 1893.

20th March 1893.—No. 15518—G. 3713.—Under Article 172 of the Mysore Service Regulations, Mr. B. Ramaswami Iyer, Officiating Assistant Conservator of Forests, Kadur District, was granted casual leave of absence for 15 days from the 7th to 21st February 1893, both days inclusive.

No. 15522—G. 3717.—Under the terms of Article 172 of the Mysore Service Regulations, Mr. B. Ramaswami Iyer, Officiating Assistant Conservator of Forests, Kadur District, is granted privilege leave of absence for 2½ months, with effect from such date as he may avail himself of the same.

2. During the absence of Mr. Ramaswami Iyer on leave, Mr. B. Hira Singh, Forest Probationer, Shikarpur Sub-Division, is appointed to act for Mr. Ramaswami Iyer in the Kadur District, and Mr. M. G. Rama Rao, Forest Probationer, Shimoga District, to act for Mr. Hira Singh in the Shikarpur Sub-Division.

VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

1—GAZETTE OF INDIA.

7th April, 1893. No. 392-F.—The following changes are made consequent on the return from furlough of Mr. H. C. Hill, Conservator of Forests, 1st Grade, with effect from 18th March 1893:

Mr Hill to be Conservator of the Central Forest Circle, North-Western Provinces and Oudh.

Mr. C. Bagshawe, Conservator, 2nd (officiating 1st) Grade, Central Forest Circle, North-Western Provinces and Oudh, to revert to his substantive grade.

Mr. P. J. Carter, Conservator, 3rd (officiating 2nd) Grade, Pegu Forest Circle, Lower Burma, to revert to his substantive grade.

7th April 1893. No 396-F.—With reference to the Notification of this Department, No. 339-F., dated the 17th ultimo, Mr. C. Bagshawe, Conservator of Forests, 2nd Grade, is appointed to be Conservator of the Berar Forest Circle, with effect from the date on which he may relieve Mr. F. B. Dickinson of the charge of that Circle.

19th April, 1893. No. 432 F.—With reference to the Notification of this Department, No. 396-F., dated the 7th instant, Mr. Bagshawe assumed charge of the Berar Forest Circle on 31st March 1893, on which date Mr. Dickinson, Officiating Conservator, availed himself of the furlough granted him in Notification No 339-F., dated the 17th ultimo.

21st April 1893. No. 439 F. —Mr. Dansey, Conservator of Forests, 2nd Grade, Bengal, availed himself on 14th April 1893 of the privilege leave granted him in the Notification of this Department, No. 206 F., dated the 17th February last; and Mr. Chester's appointment as Officiating Conservator, 3rd Grade, Bengal, took effect from that date.

Mr. P. J. Carter, Conservator, 3rd Grade, Pegu Circle, Lower Burma, is appointed to officiate in the 2nd Grade of Conservators from the same date.

2—MADRAS GAZETTE.

28th March, 1893. No. 147.—

No.	Name and designation of officer.	Present grade.	Grade to which promoted.	Nature of promotion.	Remarks showing cause of vacancy,
1	Mr. E. R. Murray ...	Deputy Conservator of Forests, Fourth Grade.	Deputy Conservator of Forests, Third Grade.	Acting ..	With effect from 1st April 1893 (during the absence of Mr. Porter on furlough, or until further order).
2	Mr. P. M. Lushington ...	Do. ...	Do. ...	Do. ...	With effect from 1st April 1892 (during the deputa-tion of Mr. A. W. Lushington to act in the second grade, or until further orders).

24th March 1893.—To Ranger Balaji Singh for two month from date of relief, under article 291 of the Civil Service Regulation.

15th April 1893. *Posting and Results of 1891 Dehra Dun Students*—The following are the results for the Government students from the Southern Circle, who went up to the Dehra Dun School in 1891:—

Mr. H. E. Kelly, Ranger on Rs. 50, obtained the Higher Standard Certificate, and is posted to South Coimbatore.

Mr. F. S. Brito, Forester on Rs. 40, obtained the Higher Standard Certificate.

„ A. B. Myers,	do.	do.	with Medal in Surveying.
„ C. E. Allen,	do.	do.	with Prize for Entomology.
„ E. J. D. Pierce,	do.	do.	
„ W. B. Jackson,	do.	do.	

K. Gajaraja Mudaliar, Forester, on Rs. 30 do. with Medal in Botany.
S. Kuppasawmy Chetty, do.

17th April, 1893 No. 189 —Mr. T. P. Peake, Assistant Conservator of Forests, Madras, has been granted by the Right Honorable the Secretary of State for India an extension of furlough for six months, in continuation of the furlough notified at page 283, Part I, of the *Fort St. George Gazette*, dated 15th March 1893.

20th April, 1893. No. 187 —Mr Charles D'Arcy McArthy, District Forest Officer, Vizagapatam, is granted privilege leave for one month and twelve days, under article 291 of the Civil Service Regulations.

22nd April 1893 No. 190.—The privilege leave for two months granted to Mr. W. Carroll, District Forest Officer, Chingleput, published at page 182, Part I of the *Fort St. George Gazette*, dated 14th February 1893, is extended by eighteen days.

15th April 1893 —To Ranger M. Shumuddin Sahib, Salem District, for three months, under article 373 of the Civil Service Regulations.

29th April, 1893.—Of the officers who were deputed from the Central circle to undergo the Dehra Dun Forest School course of 1891-93, the following have obtained the Higher Standard Certificate:—

Forester T. Arumuga Mudaliar

Do S. Ramaswami Aiyar, with Medal in Forest Mathematics.

Ranger Venkata Kistnama Nayudu.

Forester C. Rajagopal Nayudu.

Do. A. P. Ramachandra Mudaliar.

23rd April, 1893.—Mr. G. R. Middleton, South Arcot District, from the 4th Grade to 5th Grade Ranger from the 23rd April 1893.

23rd April, 1893 —Ranger M. Rama Row, 5th Grade Ranger, acting 4th Grade sub *pro tem.*, is confirmed in the 4th Grade and to officiate in the 3rd Grade.

23rd April 1893 —Mr. G. R. Middleton, 5th Grade Ranger, from the South Arcot to the North Arcot District. To join at once.

17th April, 1893.—S. Solomon, Acting sub. *pro tem.* Ranger on Rs. 50, North Coimbatore, is declared to have completed in March 1893 the test in Surveying and Levelling prescribed in the Madras Forest Code, para. 43.

18th April, 1893.—S. Solomon, Acting sub. *pro tem.* Ranger on Rs. 50, North Coimbatore, is confirmed as Ranger on Rs. 50, from 1st April 1893.

3.—BOMBAY GAZETTE.

1st April, 1893. No. 2356.—His Excellency the Governor in Council is pleased to appoint Mr. W. R. Woodrow, Deputy Conservator of Forests, Third Grade, and Divisional Forest Officer, Dhárwár, to take charge of the office of the Divisional Forest Officer, Bijápur, in addition to his own duties, pending further orders.

10th April, 1893.—Mr. W. R. Woodrow, Deputy Conservator of Forests, received charge of the Divisional Forest Office, Bijápur,, from the Collector, Mr. J. Monteath, on the 5th April 1893, after office hours.

4.—BENGAL GAZETTE

30th March, 1893 No. 1565.—Babu Shama Churn Chuckerbutty, Extra-Assistant Conservator of Forests, 4th grade, is permitted to retire from the Public Service, with effect from the 15th November 1892.

3rd April, 1893 No. 1567.—The Notification, No. 3584 For., dated the 17th October, 1892, published at page 940, Part I of the *Calcutta Gazette* of the 19th idem, declaring that a record of rights should be prepared in respect of all forests in the Palamau district constituted reserves under section 34 of the Indian Forest Act VII of 1878, is hereby cancelled.

8th April 1893 No. 1760 —Mr. C. C. Hatt, Assistant Conservator of Forests, attached to the Darjeeling Forest Division, is granted one month's Examination leave, under section 69 of the Forest Department Code, with effect from the 1st April, 1893, or any subsequent date on which he availed or may avail himself of the leave.

5.—N. W. P. OUDH GAZETTE

5th April, 1893. No. ⁹⁴⁶~~11-82A~~.—Lala Har Swarup, Extra Assistant Conservator, (Superintendent, Timber Depôt) from Bahramghát to the Gorakhpur Forest Division.

6.—PUNJAB GAZETTE.

12th April, 1893. No. 264.—Mr. G. S. Hart, Officiating Deputy Conservator of Forests, and Lala Jowála Parshád, Extra Assistant Conservator of Forests, respectively made over and received charge of the Umballa Forest Division on the afternoon of the 1st instant consequent on the separation of the Simla Hill Tracts from that Division.

13th April, 1893. No. 269.—The privilege leave of absence granted to Mr. G. S. Hart, Officiating Deputy Conservator of Forests, in Notification No. 101, dated the 7th February 1893, is hereby extended by a period of two days,

7.—CENTRAL PROVINCES GAZETTE.

30th March, 1893. No. 1519.—*Erratum*. In this Notification No. 4373 dated the 14th November 1892, for "6th instant" *Substitute* "6th October 1892," as the date from which Mr. P. H. Clutterbuck, Assistant Conservator of Forests, was granted three months' privilege leave

13th April, 1893. No. 1770.—Leave, under Article 843 of the Civil Service Regulations, is granted to Mr. Menzies, Assistant Conservator of Forests, with effect from the 6th January 1893, on which date he availed himself of it.

8.—BURMA GAZETTE.

25th March 1893. No. 4.—With reference to Revenue Department Notification No. 60 (Forests), dated the 22nd February 1893, Mr. H. G. Sharpe, I. C. S., Assistant Commissioner, reported his arrival at Mònywa for Forest Settlement duty on the forenoon of the 21st March 1893.

29th March 1893. No. 114.—Mr. W. F. L. Tottenham, Assistant Conservator of Forests, is transferred from Pegu to the charge of the Agency and Dépôt division of the Pegu circle.

29th March, 1893. No. 115.—Under the provisions of Articles 277 and 291 of the Civil Service Regulations, privilege leave for three months is granted to Mr. J. Allmark, Extra Assistant Conservator of Forests, with effect from the 1st April 1893, or the subsequent date on which he may avail himself of it.

7th April, 1893. No. 5.—With reference to Revenue Department Notifications Nos 114 and 115 (Forest), dated the 26th March 1893, Mr J Allmark, Extra Assistant Conservator of Forests, made over, and Mr. W. F. L. Tottenham, officiating Deputy Conservator of Forests, received charge of, the Rangoon Dépôt and Agency division on the afternoon of the 7th April 1893.

9.—ASSAM GAZETTE.

The 21st April, 1893. No 4183 G—Privilege leave of absence for three months, under article 291 of the Civil Service Regulations, is granted to Mr. J. C. Kelly, Extra Assistant Conservator of Forests, in charge of the Nowgong Forest Division, with effect from the 1st May 1893, or the subsequent date on which he is relieved of his duties,

VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—GAZETTE OF INDIA.

12th May, 1893. No. 492-F.—Privilege leave for three months, under Articles 277 and 291 of the Civil Service Regulations, is granted to Mr. J. A. McKee, Officiating Conservator of Forests, 3rd Grade, Assam, with effect from 8th May 1893.

Mr. R. H. M. Ellis, Deputy Conservator, 1st Grade (provisional), Assam, is appointed to officiate in the 3rd Grade of Conservators, and to hold charge of the Assam Forest Circle during Mr. McKee's absence, or until further orders.

2.—MADRAS GAZETTE.

24th April 1893. No. 198.—Mr. Eber Hardie, District Forest Officer, North Malabar, is granted privilege leave for three months, under Article 291 of the Civil Service Regulations.

27th April 1893. No. 202.—Mr. H. H. Ward, Extra Assistant Conservator of Forests, Fourth Grade, to act as District Forest Officer, Vizagapatam, during the absence of Mr. C. D. McCarthy on privilege leave, or until further orders.

30th April 1893.—Ranger P. Venkatakrishnama Naidu from North Arcot to Salem.

Promotion.—Ranger Mr. G. W. Thompson, Salem District, to act as Ranger, 4th Grade, during the absence of Ranger Shamsheuddin Sahib on leave, with effect from the 11th April 1893.

Confirmation.—Mr. W. H. Blacker, Ranger, sub. *pro tem.*, 5th Grade, North Arcot District, in the 5th Grade, from 1st April 1893.

P. Venkatakrishnama Naidu, Ranger, 5th Grade, acting sub. *pro tem.*, Salem District, in the 5th Grade, with effect from the 16th April 1893.

Reversion.—C. Dhan Singh, Acting Ranger, 5th Grade, Trichinopoly to Forester, 1st Grade, with effect from 1st May 1893.

3rd May 1893. No. 212.—Mr. F. C. Cowley-Brown, Assistant Conservator of Forests, Salem District, is granted examination leave for two months from or after 15th May 1893.

13th May 1893. No. 239.—Mr. W. C. Hayne, District Forest Officer, Trichinopoly, is granted privilege leave for two months, from or after the 13th May 1893, under Article 291 of the Civil Service Regulations.

13th May 1893. No. 240.—M. B. Ry. V. Alwar Chetty Garu, Extra Assistant Conservator of Forest, Second Grade, to act as District Forest

Officer, Trichinopoly *cum* Tanjore, during the absence of Mr. W. C. Hayne on leave, or until further orders.

8th May 1893.—S. Arokiasami Pillai, Forest Ranger, Ganjam District, is transferred to Bellary District on public service.

9th May 1893.—Mr. H. E. Kelly, Ranger on Rs. 50, South Coimbatore Division, is granted privilege leave on medical certificate for one month, under Article 291 of the Civil Service Regulations, from 15th April 1893.

3.—BOMBAY GAZETTE.

1st May 1893.—Mr. J. A. McIver delivered over and Mr. W. F. Sinclair received charge of the office of the Forest Settlement and Demarcation Officer, West Thána on the 20th ultimo, in the afternoon.

2nd May 1893 No. 3163.—The undermentioned officers passed an examination in Sindhi according to the Lower Standard on 10th April 1893

Mr. J. Baptista, Extra Assistant Conservator of Forests, Sukkur.

5th May 1893. Messrs. E. G. Oliver, Deputy Conservator of Forests, and R. H. Madan, Extra Assistant Conservator of Forests, respectively delivered over and received charge of the Divisional Forest Office, West Khándesh, on the 18th April 1893, afternoon.

10th May 1893 Messrs. R. H. Madan and B. H. Dalal, Extra Assistant Conservators of Forests, respectively delivered over and received charge of the Divisional Forest Office, West Khándesh, on the 2nd instant, afternoon.

16th May 1893. Messrs. R. H. Madan and L. D. Joshi, Extra Assistant Conservators of Forests, respectively delivered over and received charge of the Divisional Forest Office, East Khándesh, on the 2nd instant, in the afternoon.

22nd May 1893. No. 3753.—The undermentioned officers passed on the 12th ultimo the examination prescribed in Rule 6 of the Rules published in Government Notification No. 2878, dated 4th June 1880, for the examination of Forest Officers :—

(1) Mr. O. L. H. Napier, Assistant Conservator of Forests, Naushahro Division, Hyderabad District.

(2) Mr. J. Baptista, Extra Assistant Conservator of Forests, Sukkur.

22nd May 1893 No. 3755.—Mr. O. H. L. Napier, Assistant Conservator of Forests, Naushahro Division, Hyderabad District, passed an examination in Sindhi according to the Higher Standard on the 12th ultimo.

4.—BENGAL GAZETTE.

2nd May 1893. No. 2076 —Mr. E. G. Chester, Deputy Conservator of Forests, 2nd Grade, having been appointed to officiate as Conser-

vator of Forests, Bengal, during the absence, on three months' privilege leave, of Mr. E. P. Dansey, or until further orders the following promotions are hereby made in the Upper Controlling Staff of the Forest Department in Bengal, with effect from the 14th April 1893:—

Mr. C. G. D. Fordyce, Deputy Conservator of Forests, 3rd grade is appointed to officiate in the 2nd grade of Deputy Conservators.

Mr. R. L. Heinig, Deputy Conservator of Forests, 4th grade, to officiate in the 3rd grade of Deputy Conservators.

Mr. W. H. Lovegrove, Assistant Conservator of Forests, 1st grade, to officiate in the 4th grade of Deputy Conservators.

2nd May 1893. No. 2077.—The following promotions are made in the Upper Controlling Staff of the Forest Department in Bengal, consequent on the grant of seven months' furlough to Mr. W. M. Green, Deputy Conservator of Forests, third grade, with effect from the 1st April 1893:—

Mr. C. A. G. Lillingston, Deputy Conservator, fourth grade, is appointed to officiate in the third grade of Deputy Conservators.

Mr. H. H. Haines, Assistant Conservator, first grade, to officiate in the fourth grade of Deputy Conservators

9th May 1893. No. 2128.—Mr. F. B. Manson, Deputy Conservator of Forests, Darjeeling Division, is granted furlough for two years under article 340(b) of the Civil Service Regulations, with effect from the 18th May 1893, or any subsequent date on which he may avail himself of it.

5.—N. W. P. AND OUDH GAZETTE.

26th April 1893. No. 1185.—With effect from the 29th October 1892, Mr. J. C. Tulloch, Assistant Conservator of Forests, 2nd grade, to officiate in the 1st grade, to fill an existing vacancy.

9th May 1893. No. 1309.—Mr. J. M. Blanchfield, Extra Assistant Conservator of Forests, Kumaun Forest Division, Central Circle, privilege leave for three months, with effect from the 1st June 1893.

9th May 1893. No. 1310.—Mr. F. A. Leete, Assistant Conservator of Forests, Working Plans Officer, attached to the Kumaun Forest Division Central Circle, to hold charge of that Division, in addition to his other duties, during the absence on leave of Mr. J. M. Blanchfield, or until further orders.

6.—PNJAB GAZETTE.

3rd May 1893. No. 295.—Consequent on the transfers of Mr. E. R. Murray to Madras, of Mr. H. B. Anthony to Burma, and of Mr. H. A. Hoghton to the Central Provinces, the Amalgamated List of Forest Officers in Punjab, Central Provinces, Coorg and Berar stood as follows on the 12th August 1892:—

Amalgamated List of Forest Officers in Punjab with Baluchistan, Central Provinces, Coorg and Berar as it stood on 12th August 1892.

Sanctioned Scale.	Names of Officers.	Position of Officers.
Deputy Conservators, 1st Grade, (4)	1. J. C. McDonell ... 2. F. B. Dickenson ... 3. C. F. Elliott ... 4. J. McKee ...	On deputation. Officiating Conservator. 1 Deputy Conservator, 1st. Officiating Conservator.
Deputy Conservators, 2nd Grade, (5)	5. G. G. Minniken ... 6. W. P. Thomas ... 7. G. H. Foster ... 8. E. Forrest ... 9. L. A. W. Rind ...	2. Provisional Dpty. Consr., 1st 3. Officiating ditto. 4. Ditto ditto. 5. Deputy Conservator, 2nd. 6. Ditto.
Deputy Conservators, 3rd Grade, (5)	10. F. O. Lemarchand ... 11. G. F. Prevost ... 12. J. Ballantine ... 13. E. Dobbs ... 14. W. King ...	7. Provisional Dpty. Consr., 2nd. On special leave. On deputation. 8. Offg. Deputy Conservator, 2nd 9. Ditto ditto.
Deputy Conservators, 4th Grade, (8)	15. A. M. Reuther ... 16. J. H. Lace ... 17. L. G. Smith ... 18. F. S. Barker ... 19. H. Moore ... 20. G. F. Taylor ... 21. A. L. McIntire ... 22. H. A. Hoghton ...	10. Provisional Dpty. Consr., 3rd. 11. Ditto ditto. 12. Offg. Deputy Conservator 3rd. On furlough. Ditto. 13. Offg. Deputy Conservator 3rd. 14. Ditto ditto. 15. Deputy Conservator, 4th.
Assistant Conservators, 1st Grade, (8)	23. F. O. Hicks ... 24. R. J. P. Pinder ... 25. A. E. Lowrie ... 26. A. A. Watson ... 27. G. L. Hart ... 28. C. P. Fisher ... 29. A. V. Monro ... 30. Vacant ...	16. Provisional Dpty. Consr., 4th. 17. Ditto ditto. 18. Offg. Deputy Conservator 4th. On sick leave. 19. Offg. Deputy Conservator, 4th 20. Ditto ditto On privilege leave.
Assistant Conservators, 2nd Grade, (7)	31. C. Somers Smith ... 32. A. W. Blunt ... 33. P. H. Clutterbuck ... 34. A. M. F. Cacula ... 35. E. M. Coventry ... 36. V. S. Mannies ... 37. H. S. K. Edie ...	

3rd May 1893. No. 296.—Consequent on the departure of Mr. E. Dobbs, Officiating Deputy Conservator of Forests, 2nd Grade, on sick leave for one year, the following promotions shall have effect from 16th August 1892 :—

Mr. A. M. Reuther, Deputy Conservator of Forests, 3rd Grade, substantive (Provisional), to be Deputy Conservator of Forests, 3rd Grade, substantive (Provisional), and Officiating Deputy Conservator of Forests, 2nd Grade ;

Mr. H. A. Hoghton, Deputy Conservator of Forests, 4th Grade, to be Officiating Deputy Conservator of Forests, 3rd Grade.

3rd May 1893. No. 297.—Consequent on the departure of Mr. J. H. Lace, Deputy Conservator 3rd Grade, substantive (Provisional), on privilege leave for one month, the following promotion shall have effect from the 19th September 1892:—

Mr. F. C. Hicks, Deputy Conservator 4th Grade, substantive (Provisional), to be Deputy Conservator, 4th Grade, substantive (Provisional), and Officiating Deputy Conservator, 3rd Grade.

3rd May 1893. No. 298.—Consequent on the return of Mr. J. H. Lace, Deputy Conservator of Forests, 3rd Grade, substantive (Provisional), from privilege leave, the following reversion shall have effect from the 19th October 1892:—

Mr. F. C. Hicks, Deputy Conservator of Forests, 4th Grade, substantive (Provisional), and Officiating Deputy Conservator of Forests, 3rd Grade, to be Deputy Conservator of Forests, 4th Grade, substantive (Provisional).

3rd May 1893. No. 299.—Consequent on the return of Mr. G. F. Prevost, Officiating Deputy Conservator of Forests, 2nd Grade, from special leave, the following reversions shall have effect from the 16th December 1892:—

Mr. A. M. Reuther, Deputy Conservator of Forests, 3rd Grade, substantive (Provisional), and Officiating Deputy Conservator of Forests, 2nd Grade, to be Deputy Conservator of Forests, 3rd Grade, substantive (Provisional);

Mr. H. A. Hoghton, Officiating Deputy Conservator of Forests, 3rd Grade, to be Deputy Conservator of Forests, 4th Grade.

3rd May 1893. No. 300.—Consequent on the departure of Mr. G. G. Minniken, Deputy Conservator of Forests, 1st Grade, substantive (Provisional), on privilege leave for one month and ten days, the following promotions shall have effect from the 10th of January 1893:—

Mr. E. Forrest, Deputy Conservator, 2nd Grade, to officiate as Deputy Conservator, 1st Grade;

Mr. A. M. Reuther, Deputy Conservator of Forests, 3rd Grade, substantive (Provisional), to be Deputy Conservator of Forests, 3rd Grade, substantive (Provisional), and Officiating Deputy Conservator of Forests, 2nd Grade;

Mr. H. A. Hoghton, Deputy Conservator of Forests, 4th Grade, to be Officiating Deputy Conservator of Forests, 3rd Grade.

3rd May 1893. No. 301.—Consequent on the return of Mr. G. G. Minniken, Deputy Conservator of Forests, 1st Grade, substantive (Provisional), from privilege leave, and consequent on the departure of Mr. G. S. Hart, Officiating Deputy Conservator of Forests, 4th Grade, on privilege leave for 23 days, the following changes shall have effect from the 20th February 1893:—

Mr. E. Forrest, Officiating Deputy Conservator, 1st Grade, to revert to Deputy Conservator, 2nd Grade;

Mr. A. M. Reuther, Deputy Conservator of Forests, 3rd Grade, substantive (Provisional), and Officiating Deputy Conservator of Forests, 2nd Grade, to be Deputy Conservator of Forests, 3rd Grade, substantive (Provisional);

Mr. H. A. Hoghton, Officiating Deputy Conservator of Forests, 3rd Grade, to be Deputy Conservator of Forests, 4th Grade.

3rd May 1893. No. 302.—Consequent on the departure of Mr. A. M. Reuther, Deputy Conservator of Forests, 3rd Grade, substantive (Provisional), on furlough for nine months, the following promotion shall have effect from the 26th of February 1893.—

Mr. H. A. Hoghton Deputy Conservator of Forests, 4th Grade, to be Officiating Deputy Conservator of Forests, 3rd Grade.

3rd May 1893. No. 303.—Consequent on the appointment as Officiating Conservator of Mr. C. F. Elliott, Deputy Conservator of Forests, 1st Grade, the following promotions shall have effect from the 27th February 1893:—

Mr. E. Forrest, Deputy Conservator of Forests, 2nd Grade, to be Officiating Deputy Conservator of Forests, 1st Grade;

Mr. J. H. Lace, Deputy Conservator of the Forests, 3rd Grade, substantive (Provisional), to be Deputy Conservator of Forests, 3rd Grade, substantive (Provisional), and Officiating Deputy Conservator of Forests, 2nd Grade;

Mr. F. C. Hicks, Deputy Conservator of Forests, 4th Grade, substantive (Provisional), to be Deputy Conservator of Forests, 4th Grade, substantive (Provisional), and Officiating Deputy Conservator of Forests, 3rd Grade.

3rd May 1893. No. 304.—Consequent on the departure of Mr. J. H. Lace, Deputy Conservator, 3rd Grade, substantive (Provisional), and Officiating Deputy Conservator, 2nd Grade, on furlough for 18 months, the following promotions shall have effect from the 12th March 1893:

Mr. L. G. Smith, Deputy Conservator, 4th Grade, to officiate as Deputy Conservator, 2nd Grade;

Mr. R. J. P. Pinder, Deputy Conservator, 4th Grade, substantive (Provisional) to be Deputy Conservator, 4th Grade, substantive (Provisional), and Officiating Deputy Conservator, 3rd Grade.

8.—BURMA GAZETTE.

27th April 1893 No. 160.—Under the Provisions of Articles 277 and 291 of the Civil Service Regulations, privilege leave for three months is granted to Mr. C. W. Allan, Extra Assistant Conservator of Forests, with effect from the 1st May 1893, or the subsequent date on which he may be relieved of his duties.

27th April 1893. 161.—Mr. R. F. Lewis, Extra Assistant Conservator of Forests, 4th grade, is promoted to be Extra Assistant Conservator, 3rd grade, substantive *pro tem*, with effect from the date on which he assumed charge of his duties in the Ruby Mines subdivision. On his transfer from the Ruby Mines district, Mr. Lewis will revert to his substantive rank.

27th April 1893. No. 162.—Mr. C. R. Dun, Assistant Conservator of Forests, is transferred from Katha to the charge of the Myadaung subdivision of the Katha Forest division, during the absence of Mr. C. W. Allan on privilege leave or until further orders

21st April 1893. No. 2.—Mr. C. Ingram, Extra Assistant Conservator of Forests, reported his return to duty on the 31st March 1893 from three month's privilege leave granted to him in Revenue Department Notification No. 451, dated the 13th December 1892.

21st April 1893. No. 3.—Mr. P. W. Healy, Extra Assistant Conservator of Forests, made over, and Mr. C. Ingram, Extra Assistant Conservator of Forests, received, charge of the Agency Division on the afternoon of the 3rd April 1893.

29th April 1893. No. 164.—Mr. W. J. Lane-Ryan, Extra Assistant Conservator of Forests, 4th grade, was confirmed in the appointment of Sub-Assistant Conservator of Forests, 3rd grade, with effect from the 19th May, 1891.

No. 165. (FORESTS).—On his return from the Imperial Forest School at Dehra Dun Mr. W. J. Lane-Ryan, Extra Assistant Conservator of Forests, 4th grade, is posted to the Myittha-Panlaung subdivision of the Mandalay Forest division, his headquarters being Kayuké,

4th May, 1893. No. 174.—The following transfers are ordered :—

Mr. G. R. Long, Assistant Conservator of Forests, from Tavoy to the charge of the Agency division, Tenasserim Circle.

Mr. C. Ingram, Extra Assistant Conservator of Forests, from Moulmein to the charge of the South Tenasserim Division, Tenasserim Circle.

Mr. P. W. Healy, Extra Assistant Conservator of Forests, from Moulmein to the charge of the Kado subdivision of the Kado division, Tenasserim Circle.

28th April 1893. No. 5.—With reference to Revenue Department Notification No. 97. (Forests), dated the 16th March 1893, that part of the Pakókku district that hitherto formed part of the Lower Chindwin Forest division was transferred to the charge of the Officiating Deputy Conservator of Forests, Yaw division, on the afternoon of the 21st April 1893.

8th May, 1893. No. 2.—With reference to Revenue Department Notification No. 165 (Forests), dated the 29th April 1893, Mr. W. J. Lane-Ryan, Extra Assistant Conservator of Forests, assumed charge of the Myittha-Panlaung subdivision of the Mandalay forest division on the forenoon of the 5th May 1893.

10th May 1893. No. 177.—The following transfers are ordered in the Forest Department :—

Mr. C. W. A. Bruce, Assistant Conservator, from Kindat to Mandalay, as Personal Assistant to the Conservators of Forests, Eastern and Western Circles.

Mr. H. H. Forteach, Assistant Conservator, from Paungbyin to the charge of the Upper Chindwin division.

9.—ASSAM GAZETTE.

4th May, 1893. No. 4657G.—Mr. D. P. Copeland, Deputy Conservator of Forests, Dar rang, is placed in charge of the Nowgong Forest

Division, in addition to his own duties, during the absence on privilege leave of Mr. J. C. Kelly, Extra Assistant Conservator of Forests, or until further orders, with effect from the date of receiving charge.

17th May, 1893. No. 5116G.—With effect from the 1st April 1893, Mr. J. C. Kelly, Extra Assistant Conservator of Forests, Second Grade, is promoted to the First Grade of Extra Assistant Conservators.

25th May, 1893. No. 5330G.—Consequent on the appointment of Mr. R. H. M. Ellis, Deputy Conservator of Forests, First Grade (provisional), as Officiating Conservator of Forests, Assam, the following temporary promotions are made with effect from the 8th May 1893.

Mr. J. L. Pigot, Deputy Conservator of Forests, Second Grade (provisional), to officiate as Deputy Conservator, First Grade, provisional, and to be seconded.

Mr. D. P. Copeland, Deputy Conservator of Forests, Second Grade (provisional), to officiate as Deputy Conservator, First Grade (provisional), *vice.*, Mr. J. L. Pigot, seconded.

Mr. H. G. Young, Deputy Conservator of Forests, Third Grade (provisional), to officiate as Deputy Conservator, Second Grade (provisional),

Mr. T. J. Campbell, Deputy Conservator of Forests, Fourth Grade, to officiate as Deputy Conservator, Third Grade (provisional).

10.—HYDERABAD RESIDENCY GAZETTE.

28th April 1893. No. 115.—Mr. E. M. Coventry, Assistant Conservator of Forests, is granted examination leave for three months under section 69 of the Forest Department Code, with effect from such date as he may be relieved of his special work in Ajmere.

11.—MYSORE GAZETTE.

4th May, No. 18339.—Under Article 171 of the Mysore Service Regulations, Mr. H. Muttappa, Sub-Assistant Conservator of Forests, was granted casual leave of absence for 5 days with effect from the 8th April 1893.

11th May, 1893. No. 18783.—G. 4576.—Mr. B. Ramaswami Iyer, Officiating Assistant Conservator of Forests, Kadur District, handed over, and Mr. B. Hira Singh, Forest Probationer, assumed, charge of the Kadur District Forest Office on the forenoon of the 20th March 1893.

2. Mr. B. Hira Singh, delivered over, and Mr. M. G. Rama Rao, Forest Probationer, received, charge of the Shikarपुर Forest Sub-division Office on the forenoon of the 18th March, 1893.

VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

1 —GAZETTE OF INDIA.

6th June, 1893.—No 588-F.—The following transfers are made in consequence of the death of Mr G H Foster, Deputy Conservator of Forests, Coorg :

Mr. G. F. Prevost, Deputy Conservator, Berar, to Coorg.

Mr. H Calthrop, Deputy Conservator, Burma to Berar.

7th June, 1893.—No. 593-F.—Consequent on the return of Mr. R H. C. Whittall, Conservator of Forests, 2nd grade, from the special leave granted him, in the Notification of this Department, No. 238-F, dated the 14th February last and with effect from 26th May, 1893.

(i) Mr Whittall to resume charge of the Punjab Forest Circle.

(ii) Mr P J. Carter, Conservator, 3rd (officiating 2nd) grade, Pegu Forest Circle, Lower Burma, to revert to his substantive grade.

(iii) Mr C. F. Elliott, Deputy Conservator, 1st grade, Baluchistan, and officiating Conservator, 3rd grade, Punjab Forest Circle, to revert to his substantive appointment.

No 597-F —With reference to the Notifications of this Department, No 238-F., dated the 24th February, last, and No 593-F., dated the 7th instant, Mr. A. V. Monro, Officiating Deputy Conservator of Forest, 4th grade, Baluchistan, is re-transferred to the Punjab on being relieved by Mr C F. Elliott, Deputy Conservator, 1st grade

No 600-F.—Mr. A. A. Watson, Assistant Conservator of Forests, 1st grade, Central Provinces, is permitted, at his own request, to resign his appointment, with effect from 6th April, 1893

16th June, 1893 —No. 624-F —The following promotions are made in consequence of the retirement from the service of Mr. W R. Fisher, Conservator of Forests, 2nd Grade (on deputation in England). with effect from 1st January, 1893 :

Mr S. Eardley-Wilmot, Conservator, 3rd Grade, and officiating in the 2nd Grade, North Western Provinces and Oudh, is confirmed in the latter grade.

Major C. T. Bingham, i. s. o, Deputy Conservator, 1st Grade, and officiating Conservator, 3rd Grade, Tenasserim Forest Circle, Lower Burma, is confirmed in the latter grade.

2 —MADRAS GAZETTE.

20th May, 1893 —No. 252.—Mr H A Gass, District Forest Officer, Madura, is granted privilege leave for three months from or after 10th June 1893, under article 291 of the Civil Service Regulations.

No. 253 —Mr S. C. Moss, Extra Assistant Conservator of Forests Second Grade, to act as District Forest Officer, Madura, during the absence of Mr. H. A. Gass on leave, or until further orders.

25th May 1893.—No. 255.—The privilege leave granted to Mr. C. D. McArthy, District Forest Officer, Vizagapatam, and the appointment of Mr. H. H. Ward to act for him, notified at pages 458 and 475 of Part I of the *Fort St. George Gazette*, dated 25th April, and 2nd May, 1893, respectively, are hereby cancelled.

16th May 1893.—No. 256.—

No.	Name and designation of officer.	Present grade.	Grade to which promoted.	Nature of promotion.	Remarks showing cause of vacancy, &c.
1	Mr. C. D. McArthy, Acting District Forest Officer, Vizagapatam.	Assistant Conservator of Forests, Second Grade.	Assistant Conservator of Forests, First Grade.	Permanent.	With effect from the date of his passing the Higher Standard Examination in Vernacular.
2	Mr. C. DuPré Thornton, District Forest Officer, Tinnevely.	Do.	Do.	Do.	Do.
4	Mr. R. McIntosh, Acting District Forest Officer, Cuddapah.	Do.	Do.	Do.	Do.
4	Mr. A. B. Jackson, Acting District Forest officer, Anantapur.	Do.	Do.	Do.	Do.

21st May 1893.—Ranger J. Tapp, North Arcot District, to act as Ranger, 4th Grade, with effect from 23rd April 1893.

Forester 1st Grade C. Dhan Sing, Trichinopoly District, to act as Ranger, 5th Grade, with effect from the 14th May 1893.

24th May 1893.—The three months' privilege leave granted to, M. R. Ry. Maduranayagam Pillay, Sub-Assistant Conservator of Forests, 2nd Grade, and notified at page, 428, Part II of the *Fort St. George Gazette* of 14th March 1893, to take effect from the 11th May 1893, instead of from 15th April 1893.

17th May 1893.—V. P. Ramalingam Pillai, Ranger on Rs. 125 Tinnevely District, is granted leave on medical certificate for three months, under article 369 of the Civil Service Regulations, from 6th May 1893.

18th May 1893.—S. Arokiasami Pillai, Forest Ranger, Fifth Grade, Ganjam District, is transferred to Vizagapatam District.

This cancels office order No. 13 of 1893-94.

27th May 1893.—Mr. C. P. Howell, Sub-Assistant Conservator of Madura, is granted privilege leave on medical certificate, under article 291 of the Civil Service Regulations, for one month from 7th May 1893.

1st June. 193.—Hr. S. C. Moas, Assistant Conservator of Forests, is transferred from Tinnevely District to Madura District, pending his taking charge from the District Forest Officer, Madura District, under *Fort St. George Gazette*, Notification No. 253, dated 20th May 1893, published in the issue of 30th May 1893, Part I.

17th June 1893.—No. 308.—Mr. C. J. Woutersz, Acting District Forest Officer, South Arcot, is granted privilege leave for three months, with effect from or after the 1st July 1893, under article 291 of the Civil Service Regulations.

21st June 1893.—V. P. Ramalingam Pillai, Ranger on Rs. 125 is transferred to North Malabar—to join on completion of his leave.

T. C. R. Malaya Pillai, Ranger on Rs. 80, is transferred from North Malabar to Tinnevely.

3.—BOMBAY GAZETTE.

29th May 1893.—No. 3888.—Mr. W. A. Willinger, Extra Assistant Conservator of Forests, Second Grade, and Divisional Forest Officer, Surat, is granted an extension by twenty-five days of the privilege leave of absence for one month allowed to him in Notification dated 18th April, 1893, published at page 388 of the *Bombay Government Gazette* of the 27th idem, Part I, by the Deputy Conservator of Forests, N. C.

25th May 1893.—Messrs. B. H. Dalal, Extra Assistant Conservator of Forests, and E. G. Oliver, Assistant Conservator of Forests, respectively delivered over and received charge of the Divisional Forest Office, West Khândesh, on the forenoon of the 19th instant.

30th May 1893 Mr. L. D. Joshi, Extra Assistant Conservator of Forests, delivered over and Mr. E. G. Oliver, Assistant Conservator of Forests, received charge of the East Khândesh Divisional Forest Office on the afternoon of the 22nd, May 1893.

3rd June 1893.—Mr. F. R. Dasai, Deputy Conservator of Forests N. C., delivered over and Mr. W. A. Wallinger, Extra Assistant Conservator of Forests, Second Grade, received charge of the Divisional Forest Office, Surat, on the 31st of May 1893, before noon.

14th June 1893.—No. 4270.—His Excellency the Governor in Council is pleased to appoint Mr. J. H. Clabby to do duty as Divisional Forest Officer, Sholapur.

20th June 1893.—No. 4432.—Mr. R. H. Madan, Extra-Assistant Conservator of Forests and Divisional Forest Officer, East Khândesh, is allowed leave on medical certificate for two months under Article 369 of the Civil Service Regulations.

21st June 1893.—No. 4479.—Mr. G. A. Hight, Deputy Conservator of Forests, Second Grade, has been allowed by Her Majesty's Secretary of State for India an extension of leave on medical certificate for six months.

17th June 1893.—Messrs. T. R. D. Bell and B. J. Haselden respectively delivered over and received charge of the Central Division of Kânara on the afternoon of the 12th June 1893.

27th June 1893.—Mr. E. G. Oliver, Assistant Conservator of Forests, delivered over and Mr. R. H. Madan, L. O. E., Extra Assistant Conservator of Forests, received charge of the Divisional Forest Office, East Khândesh, on the forenoon of the 20th of June 1893.

No. 196.—His Excellency the Right Honourable the Governor of Bombay, under the authority vested in him by the Indian Councils Acts, 1861 and 1892, has been pleased to nominate the undermentioned gentlemen to be Additional Members of the Council of the Governor of Bombay for the purpose of making Laws and Regulations only :—

Mr. A. T. Shuttleworth.

4.—BENGAL GAZETTE.

19th June 1893.—The report of the Central Examination Committee, having been received, the result of the Half-yearly Departmental Examination of Assistant Magistrates and others, held in May 1893, is published for general information :—

1. Mr. C. C. Hatt, Assistant Conservator of Forests, has passed in Hindustani by the higher standard.

2. Mr F. Trafford, Assistant Conservator of Forests, has passed in Hindustani by both standards, and in Land Revenue Systems.

3. Mr A. H. Mee, Extra Assistant Conservator of Forests, has passed in Hindustani by the higher standard.

19th June, 1893.—No. 2368.—Mr. C. A. G. Lillingston, Deputy Conservator of Forests and Personal Assistant to the Conservator of Forests, Bengal, assumed charge of the Darjeeling Forest Division on the afternoon of the 5th May, 1893, from Mr. F. B. Manson, Deputy Conservator of Forests, granted two years' furlough.

19th June, 1893.—No. 2369.—Consequent on the grant, with effect from the 13th May, 1893 of two years furlough to Mr. F. B. Manson, Deputy Conservator of Forests, 2nd Grade, the following temporary promotions are made in the Upper Controlling Staff of the Bengal Forest Service :—

Mr. G. A. Richardson, Deputy Conservator of Forests, 3rd grade, is appointed to officiate in the 2nd grade of Deputy Conservators.

Mr. C. G. Rogers, Deputy Conservator, 4th grade (seconded), is appointed to officiate in the 3rd grade of Deputy Conservators.

Mr. H. D. D. French, Deputy Conservator, 4th grade (provisional) is appointed to officiate in the 3rd grade of Deputy Conservators, vice Mr. C. G. Rogers (seconded).

24th June 1893.—No. 2375.—Mr. F. Trafford, Assistant Conservator of Forests attached to the Singhbhum Division, is granted six months' leave on medical certificate, under article 343 of the Civil Service Regulations, with effect from the 18th June 1893

5.—N. W. P. AND OUDH GAZETTE.

29th May 1893.—No. 1465 11—32A.—Mr. E. L. Haslett, Extra Assistant Conservator of Forests, from the Grhwal to the Naini Tal Forest Division of the Central Circle.

No. 1476—11—626C—In supersession of Notification No. 1310—11—626C—dated 9th May 1893, Mr. F. A. Leete, Assistant Conservator of Forests, attached to the Garhwal Forest Division, Central Circle, to hold charge of the Kumaun Forest Division

during the absence on leave of Mr. J. M. Blanchfield, Extra Assistant Conservator, or until further orders.

21st June 1893.—No. 1738.—Mr. B. A. Rebach, Deputy Conservator of Forests, Bahraich Forest Division, in the Oudh Circle, privilege leave for three months, with effect from the 20th July 1893.

21st June 1893 No. 1739—II—651B.—Mr. B. B. Osmaston Assistant Conservator of Forests, Working Plans Officer, attached to the Direction Division of the Oudh Circle, to officiate as Deputy Conservator of Forests, 4th grade, and to hold charge of the Bahraich Forest Division, in the same Circle, during the absence on leave of Mr. B. A. Rebach, or until further orders.

6.—PUNJAB GAZETTE.

19th June 1893.—No. 368.—Messrs L. Gisborne Smith, Deputy Conservator of Forests, and A. V. Monro, Officiating Deputy Conservator of Forests, respectively made over and received charge of the Direction Division and the duties of Personal Assistant to the Conservator of Forests,, Punjab, on the afternoon of the 8th June, 1893.

7.—CENTRAL PROVINCES GAZETTE.

25th May 1893.—No. 15.—Mr. R. H. Cole, Forester, 1st grade, in the Nimar Forest Division, having complied with the conditions laid down in Section 29 (I) of the Forest Department Code, is promoted, under Section 49 of said Code, to Ranger, 6th grade, on Rs. 50 per mensem, on probation for one year, with effect from the 1st April 1893.

21st June 1893.—No 4679 —The undermentioned officer of the Forest Department is declared to have passed the prescribed Departmental Examination in Forest Law:—

Mr. S. R. Parsons, Forest Ranger.

8 —BURMA GAZETTE.

25th May 1893. No 190.—Mr. D. L. K. Calderwood, Extra Assistant Conservator of Forests, is transferred from Alon to the charge of the Gangaw subdivision, of the Yaw Forest division, with headquarters at Gangaw.

11th May 1893. No. 4.—Mr. C Ingram, Extra Assistant Conservator of Forests, made over, and Mr P. W. Healy, Extra Assistant Conservator of Forests, received charge of, the Agency division on the afternoon of the 8th May 1893.

18th May 1893. No. 6.—With reference to Revenue Department Notification No. 177, dated the 10th instant, Mr. C W. A. Bruce, Assistant Conservator of Forests, made over, and Mr. H. H. Forteach, Assistant Conservator of Forests, Paungbyin subdivision, assumed charge of the Upper Chindwin Forest division on the afternoon of the 3rd May 1893 in addition to his other duties.

No. 7.—With reference to Revenue Department Notification No. 177, dated the 10th instant, Mr. C. W. A. Bruce, Assistant Conservator of Forests, reported his arrival in Mandalay, and assumed charge of his duties as Personal Assistant to the Conservator of Forests, Eastern and Western Circles, on the forenoon of the 15th instant.

23rd May 1893. No. 5.—Mr. P. W. Healy, Extra Assistant Conservator of Forests, made over, and Mr. G. R. Long, Assistant Conservator of Forests, received charge of, the Agency division on the afternoon of the 20th May, 1893.

23rd May 1893. No. 6.—Mr. G. R. Long, Assistant Conservator of Forests, made over, and Mr. C. Ingram, Extra Assistant Conservator of Forests, received, charge of the South Tenasserim division on the afternoon of the 12th May, 1893.

23rd May 1893 No. 3.—Mr. C. W. Alan, Extra Assistant Conservator of Forests, availed himself on the forenoon of the 16th May 1893 of the privilege leave granted him in Revenue Department Notification No. 160 (Forests), dated the 27th April, 1893.

23rd May 1893. No. 4.—With reference to Revenue Department Notification No 162 (Forests), dated the 27th April 1893, Mr. C. W. Allan, Extra Assistant Conservator of Forests, and Mr. O. B. Dym Assistant Conservator of Forests, respectively made over and received charge of the Myadaung subdivision of the Katha Forest division on the afternoon of the 15th May 1893.

31st May 1893 No 193.—The following officers have been granted extensions of leave by the Secretary of State for India for the periods noted against them :—

Mr. J. Copeland, Deputy Conservator of Forests, four months extraordinary leave without pay.

Mr. H. Carter, Assistant Conservator of Forests, three months leave on medical certificate.

1st June 1893 No. 194.—Mr. C. W. B. Anderson, Extra Assistant Conservator of Forests, is transferred from Kindat to the charge of the Paungbyin subdivision of the Upper Chindwin forest division.

29th May 1893. No. 7.—With reference to Revenue Department Notification No. 190 (Forests), dated the 25th May 1893, Mr. D. L. K. Calderwood, Extra Assistant Conservator of Forests, made over, and Mr. T. H. Aplin, Deputy Conservator of Forests, assumed, charge of the Alón Revenue subdivision, Lower Chindwin Forest division, on the forenoon of the 22nd inst., in addition to his other duties 1893 No. 8.—3rd May 1893, in addition to other duties.

31st May 1893. No. 8.—With reference to Revenue Department Notification No. 177, dated the 10th instant, Mr. C. W. A. Bruce, Assistant Conservator of Forests, made over, and Mr. H. H. Fortescue, Assistant Conservator of Forests, in charge of the Paungbyin subdivision, received, charge of the Upper Chindwin Forest division on the afternoon of the 3rd May 1893, in addition to other duties.

5th June 1893. No. 9.—Mr. C. W. B. Anderson, Extra Assistant Conservator of Forests, assumed charge of the Paungbyin Revenue station, Upper Chindwin Forest division, with effect from the 1st June 1893.

10th June 1893 No. 204.—In supersession of this departmental Notification No. 194, dated the 1st June 1893, Mr. C. W. B. Anderson, Extra Assistant Conservator of Forests, is transferred from Kindat to

the charge of the Paungbyin revenue station of the Upper Chindwin Forest division.

No. 205.—The following transfers are ordered :—

Mr. C. W. A. Bruce, Assistant Conservator of Forests, from Mandalay to the charge of the Upper Chindwin Division.

Mr. H. Forteach, Assistant Conservator of Forests, from Kindat to Mandalay, as Personal Assistant to the Conservator of Forests, Eastern and Western Circles.

19th June 1893. No. 215.—Mr. J. Messer, Assistant Conservator of Forests, is transferred from the Working Plans division to the Toungoo division, Pegu Circle.

No 216.—The Chief Commissioner appoints Mr. C. W. A. Bruce, Assistant Conservator of Forests, to the charge of the Paungbyin subdivision of the Upper Chindwin division in addition to his other duties.

No 223.— Mr. C R. Dun, Assistant Conservator of Forests, it transferred from Tigyaing to the charge of the Mandalay Forest Division.

No. 224.—Mr. R. F Lewis, Extra Assistant Conservator of Forests is appointed to the charge of the Myadaung subdivision of the Katha Forest division in addition to his to other duties.

21th June 1893 No. 225.—Mr. J. Allmark, Extra Assistant Conservator of Forests, is permitted to return to duty within the period of the leave granted to him in this department Notification No. 115, dated the 29th March 1893, and is posted to the charge of the Agency and Depot division of the Pegu circle.

No. 226. —Mr. W. F. L. Tottenham, officiating Deputy Conservator of Forests, is transferred to the charge of the Pegu subdivision of the Rangoon Forest division on being relieved by Mr. Allmark.

9.—ASSAM GAZETTE.

16th June 1893. No. 1 —The undermentioned candidates have been awarded Scholarships of Rs. 30 each per mensem in the Dehra Dun Imperial Forest School :

Babu Krishua Chandra Sarma, Sylhet.

Mr. W. Breaky. Dhubri.

10.—HYDERABAD RESIDENCY GAZETTE

29th April 1893, No. 115-B.—The Resident is pleased to declare that the following Extra Assistant Conservators have passed the Higher Standard Examination in Marathi prescribed for Forest Officers in the Hyderabad Assigned Districts :—

Mr. B. Bhukan.

„ Sreenivasulu Naidu.

1st May 1893. No. 116.—Under the provisions of Government of India, Revenue and Agricultural Department, Circular No. 18-F, dated the 29th July 1891, the following changes in the position and designation of the officers of the Lower controlling staff of the Forest service in the Central Provinces, Berar and Coorg, shall have effect from the 26th February 1891 :—

Name.	From	To
Mr. Chander Kumar Chatterji ...	Sub-Asst. Consr. of Forests, 1st grade ...	Extra Asst Consr. of Forests, 1st grade'
Khan Sahib Mahomed Ghouse ..	Do. do. ...	Do. do.
Mr. Mansukh Rai ...	Do. 2nd grade ...	Do. do.
Mr. Shridhar Ganesh Paranjpe	Do. do. ..	Do. 2nd grade.
Mr. Norman Chester McLeod ...	Do. do. ...	Do. do.
Mr. J. J. Hobday...	Do 3rd grade ...	Do. do.
Mr. C. H. Haldane. ...	Do. do. ...	Do. 3rd grade
Mr. Ahmed Ali, ...	Do. do. ...	Do. do.
Mr. Rasul Khan. ...	Do. 2nd grade ...	Do. 4th grade.
Mr. Bukhan ...	Offg. do. 3rd grade	Offg. do.
Mr. Ramohandra Krishna. ...	Do. do. ...	Do. do. do.
Mr. R. C. Thompson. ...	Do. do. on probation. ...	on probation.

1st May 1893 No. 117.—Mr. Srinivasulu Naidu, Sub-Assistant Conservator of Forests, 3rd grade, on probation, is appointed Extra Assistant Conservator of Forests, 4th grade, on probation, with effect from the 5th May 1891.

" No. 118.—Mr. Bukhan, Officiating Extra Assistant Conservator of Forests, 4th grade, is confirmed in that grade with effect from the 1st October 1891.

" No. 119.—Mr. Srinivasulu Naidu, Extra Assistant Conservator of Forests, on probation, is appointed Extra Assistant Conservator of Forests, 4th grade, with effect from the 21st July 1892.

" No. 120 —Mr. L. K. Martin is appointed as Extra Assistant Conservator of Forests, 4th grade, on probation, with effect from the 24th July 1892.

11. MYSORE STATE GAZETTE;

21st June 1893. No 21137—G. 5254—Mr. C. E. M. Russell, Superintendent of Forests and Government Farms, having returned from the 3 years and 4 months' leave granted him in Notifications No. 47. dated 5th June 1890, and No. 422, dated 24th February 1891, and reported himself for duty on the 1st instant, the unexpired portion of his leave is hereby cancelled.

VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—GAZETTE OF INDIA.

21st July, 1893.—No. 796-F.—Consequent on the return from privilege leave of Mr. E. P. Dansey, Conservator of Forests, 2nd grade, Bengal, the following reversions are ordered, with effect from 14th July 1893 :

Mr. R. H. E. Thompson, Conservator, 3rd (officiating 2nd) grade, Northern Circles, Central Provinces, to his substantive grade.

Mr. E. G. Chester, Officiating Conservator, 3rd grade, Bengal, to his substantive appointment of Deputy Conservator, 1st grade,

2.—MADRAS GAZETTE.—

26th June, 1893.—M. R. Ry. C. M. Maduranayagam Pillai, Sub-Assistant Conservator, from North Arcot to South Arcot District—to join on expiration of his leave.

1st July, 1893.—Ranger P. Venkatakrishnama Naidu from Salem to North Arcot.

17th June, 1893.—N. Nagarazu, Forest Ranger, 5th grade, Palkonda Range, Vizagapatam District, is granted two months privilege leave, with effect from the 8th of June, 1893.

28th June, 1893.—Mr. H. Stafford, Forest Ranger, Kurnool, is granted fifteen days' privilege leave, with effect from 27th June 1893, or from such date as he avails himself of the same.

3rd July, 1893.—A. R. Rama Row, Ranger on Rs. 50, is transferred from North Coimbatore to South Coimbatore—To join at once.

9th July, 1893.—The one month's privilege leave granted in Service Order No. 87 of 1893 to Mr. C. P. Howell, Sub-Assistant Conservator on Rs. 150, Madura, from 7th May 1893, is hereby commuted into leave on medical certificate, under article 369 of the Civil Service Regulations, and the same is extended by five months.

15th July, 1893.—No. 360—Mr J. G. F. Marshall, Acting District Forest Officer, North Arcot, is granted privilege leave for three months, with effect from or after 1st August 1893, under article 291 of the Civil Service Regulations.

17th July, 1893.—The transfer of Ranger P. Venkatakrishnama Naidu from Salem to North Arcot District, ordered in this office order No. 38 of 1893-94, is cancelled.

20th July, 1893.—Ranger Mr. Middleton is granted two months' leave without allowances, under article 372 of the Civil Service Regulations, with effect from 22nd June 1893

20th July, 1893.—A. S. Mariapragasam Pillai, Ranger on Rs. 80, South Coimbatore Division, is granted sick leave on medical certificate for three months, under article 369 of the Civil Service Regulations, from date of relief.

3.—BOMBAY GAZETTE.

1st July, 1893.—Messrs. W. R. Woodrow and T. K. D. Bell, Deputy Conservators, respectively delivered over and received charge of the Divisional Forest Office, Bijapur, on the forenoon of the 22nd June 1893.

3rd July, 1893.—Mr. J. H. Clabby, Extra Assistant Conservator of Forests, handed over charge of the Poona Sub-Division Forest Office to Mr. A. D. Wilkins, Deputy Conservator of Forests, on the afternoon of the 27th June 1893.

Mr. S. Hornidge, A. M. I. C. E., Deputy Conservator of Forests, delivered over and Mr. J. H. Clabby, Extra Assistant Conservator of Forests, received charge of, the Divisional Forest Office, Sholapur, on the forenoon of the 28th June 1893.

3rd July, 1893.—No. 4751.—Mr. A. C. Robinson, L. C. E., Extra Assistant Conservator of Forests, Fourth Grade, and Sub-Divisional Forest Officer, Kolaba, is allowed privilege leave of absence for three months from 10th July 1893.

5th July, 1893.—No. 4864.—Mr. T. B. Fry, Deputy Conservator of Forests, Second Grade, and Divisional Forest Officer, Working Plans, N. C., is allowed privilege leave of absence for three months from 4th August 1893.

8th July, 1893.—No. 4946.—His Excellency the Governor in Council is pleased to appoint Mr. G. P. Millett to act as Working Plans Officer, Northern Circle, in addition to his own duties, during the absence of Mr. T. B. Fry on privilege leave, or pending further orders.

12th July, 1893.—No. 5067.—His Excellency the Governor in Council is pleased to appoint Mr. Ganpat Jayavant Raje to act as Extra Assistant Conservator of Forests in the Fourth Grade, during the absence of Mr. A. C. Robinson, L. C. E., or pending further orders.

7th July, 1893.—Mr. Lakshman Daji Joshi, Extra Assistant Conservator of Forests, delivered over charge of the Sub-Division Forest Office, East Khandesh, to Mr. R. H. Madan, Extra Assistant Conservator of Forests, on the afternoon of the 28th June 1893, and received charge of the Sub-Division Forest Office, Poona, from Mr. A. D. Wilkins, Deputy Conservator of Forests, on the forenoon of the 3rd instant.

4.—BENGAL GAZETTE.

26th June, 1893.—No. 2890.—Mr. W. H. Lovegrove, Officiating Deputy Conservator of Forests, 4th grade, in charge of the Kurseong Division, on being relieved of that charge by Mr. Lillingston, is posted to the charge of the Chittagong Division.

Mr. C. A. G. Lillingston, Officiating Deputy Conservator, 3rd grade, Darjeeling, will hold charge of the Kurseong Division in addition to his other duties.

6th July, 1893.—No. 2409.—Mr. H. H. Haines, Officiating Deputy Conservator of Forests, in charge of the Jalpaiguri Forest Division, is granted leave for three months, under article 291 of the Civil Service Regulations, with effect from the 24th July 1893, or any subsequent date on which he may avail himself of it.

Mr. C. C. Hatt, Assistant Conservator, attached to the Darjeeling Forest Division, is appointed to have charge of the Jalpaiguri Forest Division, during the absence of Mr. Haines.

13th July, 1893.—No. 2468.—Mr. R. L. Heinig, Deputy Conservator of Forests, was employed as Working Plans Officer in connection with the preparation of a Working Plan for the Sunderban Forests, from February to May 1892 inclusive.

15th July, 1893.—No. 2505.—Mr. C. A. G. Lillingston, Deputy Conservator of Forests, was attached to the Direction Division from the 11th to the 16th October 1892, both days inclusive.

25th July, 1893.—No. 2634.—The services of Rai Sahib Kirty Chunder Chaudhuri, Assistant Engineer, which were placed at the disposal of the Revenue Department in the Public Works Department Notification No. 315, dated the 14th November 1892, are replaced at the disposal of that Department, with effect from the 7th August 1892, or such subsequent date as he may have completed the work in the Forest Department, on which he is now employed.

5.—N W. P. AND OUDH GAZETTE.

3rd July, 1893.—No.—1876.—Lála Har Swarup, Extra Assistant Conservator of Forests, from the 4th to the 3rd grade, with effect from the 23rd July 1892, *vice* Sardar Hira Singh, promoted.

6.—PUNJAB GAZETTE.

3rd July, 1893.—No. 381.—*Notification*.—Bháí Sadhu Sinigh Extra Assistant Conservator of Forests, and Mr. L. Gisborne Smith Deputy Conservator of Forests, respectively made over and received charge of the Hazára Forest Division on the afternoon of the 14th June 1893.

Bháí Sadhu Singh will remain attached to the Hazára Division.

7.—CENTRAL PROVINCES GAZETTE.

29th June, 1893. No. 3005.—The Officiating Chief Commissioner is pleased to invest the undermentioned Forest Officers with the powers defined in Section 71, Act VII of 1878 (the Indian Forest Act), to be exercised within the limits of their respective Divisions :—

Name.	Designation
Mr. G. F. Taylor	Deputy Conservator of Forests
Mr. A. M. Caccia	Assistant Conservator of Forests
Mr. S. G. Pranjpe	Extra-Assistant Conservator of Forests.

17th July, 1893.—No. 5316.—The following officer of the Forest Department has passed the prescribed examination in vernacular as shown below :—

HINDUSTANI.

By the Higher Standard.

Mr. N. C. McLeod, Extra-Assistant Conservator.

18th July, 1893.—No. 3304.—Mr. E. Dobbs, Deputy Conservator of Forests, Central Provinces, has been granted, by her Majesty's Secretary of State for India, two months' leave on medical certificate in extension of the one year's leave previously granted him by Notification No. 2753 of the 5th August 1892.

20th July, 1893.—No. 3332.—Mr. R. C. Thompson, Extra-Assistant Conservator of Forests, in charge of the Pranhita-Godavari Sub-Division, in the Chanda Forest Division, is transferred to the Mandla Forest Division in the same capacity.

8.—BURMA GAZETTE

20th June, 1893.—No. 11.—With reference to the Revenue Department Notification No. 205 (Forests), dated the 10th June 1893, Mr. C. W. A. Bruce, Assistant Conservator of Forests, assumed charge of the Upper Chindwin Forest division and of the Paungbyin Sub-division of that division from Mr. H. H. Forteath, Assistant Conservator, on the afternoon of the 16th June 1893, and Mr. Forteath reported his arrival at Mandalay and assumed charge of his duties as Personal Assistant to the Conservators of Forests, Eastern and Western Circles, on the afternoon of the 19th June 1893.

23rd June, 1893.—No. 6.—With reference to Revenue Department Notification Nos. 225 and 226, dated the 21st June 1893, Mr. W. F. L. Tottenham, Assistant Conservator of Forests, made over, and Mr. J. Allmark, Extra Assistant Conservator of Forests, received charge of, the Rangoon Dépôt and Agency Division on the afternoon of the 21st June 1893.

30th June, 1893.—No. 235.—Under the provisions of Article 282 (a) (i) of the Civil Service Regulations, privilege leave for three months and six days is granted to Mr F. J. Branthwaite, officiating Deputy Conservator of Forests, with effect from the 11th July 1893, or the subsequent date on which he may avail himself of it.

5th July, 1893.—No. 137.—At the Departmental examination held at Akyab, Bassein, Henzada, Thayetmyo, Moulmein, Tavoy, Mandalay, Bhamo, Katha, Mogok, Ye-u, Kindat, Monywa, Minbu, Myingyan, Meiktila, and Tauogyi (Southern Shan States), the following candidates passed in Burmese by the standards specified :—

Higher Standard.

Mr. A. M. Burn-Murdoch, Assistant Conservator of Forests.

Lower Standard.

Mr. S. Carr, Assistant Conservator of Forests,—*with credit.*

Mr. P. W. Healy, Extra Assistant Conservator of Forests.

6th July, 1893.—No. 243.—Mr. T. A. Hauxwell, Deputy Conservator of Forests, Salween-Attaran division, is placed temporarily in charge of the Agency division, Tenasserim circle, in addition to his other duties.

6th July, 1893.—No. 244.—Mr. G. R. Long, Assistant Conservator of Forests, in charge of the Agency division, is transferred temporarily to special duty in the Kado division.

7th July, 1893.—No. 142.—At the Departmental examination held at Mogok, Minbu, Meiktila, and Moulmein on the 5th June 1893, the following Forest Officers passed in the subjects specified opposite their names according to the standards prescribed for the examination of

Forest Officers in Chapter IV of the Departmental Examination Rules :—

<i>Name.</i>	<i>Passed in.</i>
Mr. A. M. Burn Murdoch, Assistant Conservator of Forests	Law and Revenue,
Mr. G. R. Long, Assistant Conservator of Forests	Procedure and Accounts.
Mr. S. Carr, F. C. H., Assistant Conservator of Forests	Ditto ditto
Mr. W. J. Lane-Ryan, Extra Assistant Conservator of Forests	Ditto ditto.
Mr. R. F. Lewis, Extra Assistant Conservator of Forests	Law, Procedure, & Accounts.

3rd July, 1893.—No. 7.—With reference to Revenue Department Notification No. 215, dated the 19th June 1893, Mr. J. Messer, Assistant Conservator of Forests relinquished charge of his duties in the Working Plans Division on the afternoon of the 23rd June 1893.

No. 8.—With reference to the aforesaid Notification, Mr. Messer, Assistant Conservator of Forests, assumed charge of his duties in the Toungoo division on the forenoon of the 24th June 1893.

3rd July, 1893.—No. 5.—With reference to Revenue Department Notification No. 223 (Forests), dated the 20th June 1893, Mr. C. R. Dun, Assistant Conservator of Forests, received charge of the Mandalay Forest Division from Mr. H. Calthrop, Deputy Conservator of Forests, on the afternoon of the 30th June 1893.

1st July, 1893.—No. 12.—With reference to Revenue Department Notification No. 190 (Forests), dated the 25th May 1893, Mr. D. L. K. Calderwood, Extra Assistant Conservator of Forests, assumed charge of the Gangaw subdivision, Yaw Forest Division, on the 18th June 1893.

5th July, 1893.—No. 6.—With reference to Revenue Department Notification No. 224 (Forests), dated the 20th June 1893, Mr. R. F. Lewis, Extra Assistant Conservator of Forests assumed charge of the Myadaung forest subdivision in addition to his other duties on the forenoon of the 3rd July 1893.

12th July, 1893.—No. 9.—Mr. F. J. Brauthwaite, officiating Deputy Conservator of Forests, in charge Working Plans Division, availed himself on the afternoon of the 10th July 1893 of the privilege leave granted him in Revenue Department Notification No. 235, dated the 30th June 1893.

17th July, 1893.—No. 254.—The following promotions are made in the Forest Department :—

With effect from the 1st January 1893, consequent on Major Bingham's confirmation as a Conservator of Forests :

Mr. J. Nisbet, Deputy Conservator, 2nd grade, to be Deputy Conservator, 1st Grade.

Mr. T. A. Hanzweil, Deputy Conservator, 3rd (officiating 2nd) grade, is confirmed in that grade.

Mr. J. Copeland, Deputy Conservator 4th grade, to be Deputy Conservator, 3rd grade.

Mr. A. F. Graddon, Assistant Conservator, 1st (officiating Deputy Conservator, 4th) grade is confirmed in that grade.

Mr. G. F. R. Blackwell, Assistant Conservator, 1st (officiating Deputy Conservator, 4th) grade, is confirmed in that grade.

Mr. W. W. T. McHarg, Assistant Conservator, 2nd (officiating 1st) grade, is confirmed in that grade.

With effect from the 1st July 1893, the date of Mr. Calthrop's transfer to Berar :—

Mr. C. L. Toussaint, Assistant Conservator, 1st (officiating Deputy Conservator, 4th) grade, is confirmed in that grade.

Mr. C. W. A. Bruce, Assistant Conservator, 2nd (officiating 1st) grade, is confirmed in that grade.

No. 255.—The Chief Commissioner is pleased to direct that, with effect from the 1st October 1893, the Southern Shan States and the Myelat, as defined in Foreign Department Notification No. 14, dated the 26th November 1891 shall be formed into a Forest Division of the Eastern Circle, that the division shall be called the Southern Shan States division, and that its headquarters shall be Fort Stedman.

No. 256.—Mr. H. Jackson is appointed to the charge of the Southern Shan States Forest Division with effect from the 1st October 1893.

11.—MYSORE GAZETTE.

No. 74—G. 38.—Under Article 171 of the Mysore Service Regulations, Mr. Venkatnaranappa, Sub-Assistant Conservator of Forests, Tumkur District, was granted casual leave of absence for 5 days from from 19th June 1893.

4th July, 1893.—No. 304.—G. 102.—Mr. S. A. Baput Rao, Assistant Conservator, delivered over, and Mr. C. E. M. Russell, Superintendent of Forests, assumed, charge of, the Bangalore District Forest Office on the forenoon of the 24th June 1893.

2. Mr. S. A. Bapu Rao is appointed to act as Head-quarter Assistant Conservator of Forests during the absence of Mr. T. Abdul Karim on leave.

VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—GAZETTE OF INDIA.

25th July, 1893.—No. 809-F.—*Erratum*.—In the Notification of this Department, No. 796-F., dated the 21st July 1893, for "substantive appointment of Deputy Conservator, 1st Grade," against Mr. E. G. Chester's name, read "substantive appointment of Deputy Conservator, 2nd Grade."

25th August, 1893.—No. 914-F.—Mr. J. A. McKee, Officiating Conservator of Forests, Assam, having rejoined his appointment on the 8th instant, forenoon, on return from the privilege leave granted him in the Notification of this department, No. 492-F., dated the 12th May last, Mr. R. H. M. Ellis, Officiating Conservator, reverted on the same date to his appointment of Deputy Conservator, 1st grade (provisional), Assam.

2.—MADRAS GAZETTE.

21st July, 1893.—V. Kalyanarama Iyer, Forest Ranger, Fifth Grade, is transferred from Anantapur to Kurnool.

26th July, 1893.—A. Egga Sastri, Forest Ranger, Fourth Grade, Godavari District, is granted 20 days' privilege leave with effect from 1st September 1893.

4th August, 1893.—No. 399.—M. R. Ry. V. Alwar Chetti Garu, Extra Assistant Conservator of Forests, Second Grade, to act as District Forest Officer, North Arcot, during the absence of Mr. J. G. F. Marshall on privilege leave, or until further orders.

9th August, 1893.—Fifteen days' privilege leave granted to Mr. Stafford in this office order No. 32 of 1893-94 is cancelled.

11th August 1893.—Ranger G. R. Middleton, upon expiration of leave, from North Arcot to Chingleput.

Ranger T. Narayanaswami Aiyar, upon being relieved by Ranger Middleton, from Chingleput to North Arcot.

19th August, 1893.—The Board of Revenue has granted nineteen days' privilege leave, under article 291 of the Civil Service Regulations, to Mr. P. M. Lushington, Deputy Conservator of Forests, Godavari District from 23rd June 1893.

3.—BOMBAY GAZETTE.

1st August, 1893.—No. 5548.—Mr. W. F. D. Fisher, Assistant Conservator of Forests, Second Grade, and Divisional Forest Officer, Panch Mahals, is allowed examination leave for two months from 6th August 1893.

1st August, 1893.—Mr. A. C. Robinson, Extra Assistant Conservator, proceeded on three months' privilege leave on the forenoon of 10th July 1893, handing over charge of the Sub-Divisional Office,

Kolába, to Mr. A. Stewart, Divisional Forest Officer, Kolába, who handed over charge of the same office to Mr. Ganpat Jaywant Rege, acting Extra Assistant Conservator of Forests, on the forenoon of the 22nd idem.

5th August, 1893.—Mr. T. B. Fry, Deputy Conservator of Forests, Second Grade, and Divisional Forest Officer, Working Plans, N. C., and Mr. G. P. Millett, Deputy Conservator of Forests, Fourth Grade, and Divisional Forest Officer, West Thána, delivered over and received charge of the Working Plans Office on the 4th August 1893, in the afternoon.

7th August, 1893 No. 5697.—His Excellency the Governor in Council is pleased to appoint Mr. E. G. Oliver to be Fourth Grade Deputy Conservator of Forests *vice* Mr. R. P. Ryan, dismissed, with effect from the date of the vacancy.

9th August, 1893. No. 5761.—The following draft rule under clause (i) of Section 25 of the Indian Forest Act 1878, is published for general information. Persons who have any objection to urge to the draft rule are required to forward their objections in writing to the Acting Chief Secretary to Government, Revenue Department, within three months from the date of publication of this Notification:—

“The poisoning, for any purpose whatever, of water within a Reserved Forest and the explosion therein of dynamite for the purpose of killing or catching fish are prohibited.”

22nd August, 1893. No. 6079.—Mr. J. Baptista, L. C. E., Divisional Forest Officer, Sukkur, passed an examination in Sindhi according to the Higher Standard on the 3rd ultimo

23rd August, 1893. No. 6095.—Mr. H. W. Keys, Deputy Conservator of Forests, Fourth Grade, has been allowed by Her Majesty's Secretary of State for India to return to duty within the period of his leave.

4.—BENGAL GAZETTE.

28th July 1893. No. 2682.—Consequent on the return from three months' privilege leave of Mr. E. P. Dansey, Conservator of Forests, Bengal, the following reversions are hereby ordered in the Upper Controlling Staff of the Bengal Forest Department, with effect from the forenoon of the 14th July 1893:—

Mr. E. G. Chester, Officiating Conservator of Forests, Bengal, to revert to his substantive appointment of Deputy Conservator of Forests, 2nd grade.

Mr. G. A. Richardson, Officiating Deputy Conservator of Forests, 2nd grade, to revert to the 3rd grade of Deputy Conservators.

Mr. C. G. Rogers, Officiating Deputy Conservator of Forests, 3rd grade (seconded), to revert to the 4th grade of Deputy Conservators.

Mr. H. D. D. French, Officiating Deputy Conservator of Forests, 3rd grade, to revert to the 4th grade of Deputy Conservators (provisional).

28th July 1893. No. 2683.—With reference to this Department's Notification, No. 2682 For., dated the 28th instant, the following arrangement of Forest Officers is hereby ordered:—

Mr. E. G. Chester, Deputy Conservator of Forests, is appointed to the charge of the Darjeeling and Kurseong Forest Divisions, *vice* Mr. C. A. G. Lillingston, Deputy Conservator of Forests, appointed Personal Assistant to the Conservator of Forests, Bengal.

28th July 1893. No. 2705.—Mr. C. C. Hatt, Assistant Conservator of Forests, second grade, is promoted to the first grade of Assistant Conservators provisionally, with effect from the 9th May 1893.

1st August 1893. No. 2724.—Mr. J. C. Mendes, Extra-Assistant Conservator of Forests, attached to the Sundarbans Forest Division, is transferred to the Singhbhum Forest Division.

15th August 1893. No. 2891.—Mr. E. E. Slane, Extra-Assistant Conservator of Forests, attached to the Darjeeling Forest Division, is temporarily placed in charge of the Kurseong Forest Division.

15th August 1893. No. 2892.—Mr. E. E. Slane, Extra-Assistant Conservator of Forests, 4th grade, is promoted to the 3rd grade of Extra-Assistant Conservators, with effect from the 15th June 1893.

5.—N.-W. PROVINCES AND OUDH GAZETTE.

11th August 1893. No. 2329.—Mr. W. Shakespear, Deputy Conservator of Forests, in charge of the Ganges Forest Division, Central Circle, privilege leave for two months, with effect from the 2nd September 1893.

11th August 1893 No. 2430.—Mr. J. M. Blanchfield, Extra Assistant Conservator of Forests, on return from leave, to hold charge of the Ganges Forest Division in the Central Circle, during the absence on leave of Mr. W. Shakespear, or until further orders.

15th August 1893 No. 2360.—The under-mentioned officer has been granted by Her Majesty's Secretary of State for India permission to return to duty :—

Name.	Service.	Appointment.	Date on which permitted to return.
Mr. E. A. Down ...	Covenanted.	Deputy Conservator of Forests.	Within period of leave.

6.—PUNJAB GAZETTE.

5th August, 1893.—No. 422.—Mr. F. O. Lemarchand, Deputy Conservator of Forests, Punjab, is granted three months' privilege leave, under Articles 277 and 291 of the Civil Service Regulations, with effect from the 27th July 1893, or such subsequent date as he may avail himself of it.

9th August, 1893.—No. 426.—Bhai Sadhu Singh, Extra Assistant Conservator of Forests, Punjab, is granted privilege leave of absence for two months under Article 291 of the Civil Service Regulations, with effect from the 15th July 1893, or such subsequent date as he may avail himself of it.

18th August, 1893.—No. 441.—Mr. Somers-Smith, Assistant Conservator of Forests, passed the examination in Hindustani by the Lower Standard on the 2nd May 1292.

19th August, 1893.—No. 445.—Under the provisions of Section 37 of the Hazára Forest Regulations, 1893, the Hon'ble the Lieutenant-Governor is pleased to empower the officer in charge of the Hazára Division, for the time being, to compound Forest offences under the said section.

7.—CENTRAL PROVINCES GAZETTE.

2nd August, No 3555.—Mr. F. S. Barker, Deputy Conservator of Forests, has been granted, by Her Majesty's Secretary of State for India, six months' leave on medical certificate in further extension of the medical leave granted to him by Notification No. 970, dated the 20th February 1893.

5th August, No 3643.—Privilege leave for three months, under Article 281 of the Civil Service Regulations, is granted to Mr. A. W. Blunt, Officiating Deputy Conservator of Forests, 4th grade, Bilaspur with effect from such date as he may be permitted to avail himself of it.

8th August, No. 3668.—Three months' privilege leave, under Article 291 of the Civil Service Regulations, is granted to Mr. G. F. Taylor, Deputy Conservator of Forests, with effect from the date on which he may be permitted to avail himself of it.

8th August, 1893 —No. 3699.—Mr. R. C. Thompson, Extra-Assistant Conservator of Forests, transferred to the Mandla Forest Division, under Notification No. 333, dated the 20th July 1893, is temporarily posted to the charge of the Nimar Forest Division.

10th August No. 3727.—Mr. H. Moore, Deputy Conservator, of Forests, Central Provinces, has been granted by Her Majesty's Secretary of State for India, ten days' furlough in extension of the furlough for one year granted him by Notification No. 2402.

10th August, 1893.—No 3845.—(1) In accordance with the provisions of Section 45 of the Indian, Forest Act (NII of 1878 as amended by Act V of 1890) the Officiating Chief Commissioner is pleased to direct that the following shall be the areas within which all unmarked wood and timber shall be deemed to be the property of Government unless and until any person establishes his right and title thereto:—

(a) All reserved forests and unclassified State forests in the Central Provinces.

(b) The following rivers and tributaries of rivers within the Central Provinces, namely, the Nerbudda, Tapti, Wardha, Kannan, Peuch, Wainganga, Pranhita, Sheonath, Mahanadi, Godavari and Indravati and their tributaries; also the several tributaries of the rivers Jamna and Son rising through the districts of Saugor, Damoh and Jubbulpore, together with an area within a direct distance of one mile from either bank of the main stream of the said rivers and tributaries of rivers, taking that stream at its cold-weather season level.

(2) The Officiating Chief Commissioner is also pleased to exempt from the provisions of Section 45 of the said Act all wood and timber found adrift, beached, stranded or sunk, excepting sal, shishum, teak, bija, and saj, of and exceeding two feet in girth and six feet in length.

No. 3846.—The following rules made by the Officiating Chief Commissioner, Central Provinces, under Section 51 of the Indian Forest Act, 1278, are published for general information :—

(1) any person may save any timber found adrift, beached, stranded or sunk, other than timber exempted from the provisions of Section 45, by *Central Provinces Gazette* Notification No. 3845 dated the 17th instant.

(2) The amount to be paid by the Government in the case of Government timber or by a private owner in the case of private timber to the salvor as salvage fees shall be 50 per cent, of the local value of the timber salvaged as adjudged by the Divisional Forest Officer.

22nd August, 1893.—No. 3943.—Mr. Mahomed Kadir Bukah, Extra Assistant Conservator of Forests, in charge of the Burhanpur Sub-Division, is temporarily posted to the charge of the Nimar Forest Division.

Notification No. 3669, dated the 8th instant, is hereby cancelled.

No. 3944.—Privilege leave for three months, under Article 291 of the Civil Service Regulations, is granted to Mr. M. Muttannah, Extra Assistant Conservator of Forests, with effect from the 1st proximo.

No. 3945. Mr. W. King, Deputy Conservator of Forests, at present in charge of the Narsinghpur Forest Division, is transferred to the Mandla Forest Division.

No. 3946.—Mr. Ali Muttaki Khan, Senior Forest Ranger, in charge of the Shahpura Range, Mandla Forest Division, is posted temporarily to the charge of the Narsinghpur Forest Division, to work under the immediate orders of the Deputy Commissioner.

23rd August 1893 No. 3981.—Mr. L. K. Martin is appointed an Extra-Assistant Conservator of Forests, 4th grade, with effect from the 24th July 1892.

Notification No. 3937, dated the 18th October 1892, is hereby cancelled

No. 3982.—The position of the officers of the Lower Controlling Staff of the Forest Service in the Central Provinces, Berar and Coorg stood as follows on the 25th August 1892:—

Name.	Appointment.	Remarks.
Mr. Chandar Kumar Chatterji	Extra-Assistant Conservator, 1st grade.	
Khan Sahib Mahomed Ghouse	Do,	
Mr. Mansukh Rai	Do.	
„ Shridhar Ganesh Paranjpe	Extra-Assistant Conservator, 2nd grade.	
„ Norman Chester MacLeod	Do.	
„ J. J. Hobday	Do.	

Name.	Appointment.	Remarks.
„ C. H. Haldane ...	Extra-Assistant Conservator, 3rd grade.	
„ Ahmed Ali ...	Do.	
„ Ramchandra Krishna ...	Do.	
„ Mahomed Kadir Baksh	Do.	
„ Rasul Khan ..	Extra-Assistant Conservator, 4th grade.	
„ Bukhan ...	Do.	
„ R. C. Thompson ..	Do.	Supernumerary.
„ Shrinivasulu Naidu ...	Do.	
„ L. K. Martin ...	Do.	
„ F. Seager ...	Do.	

Notification No. 3939, dated the 18th October 1892, is hereby cancelled.

8.—BURMA GAZETTE.

22nd July 1893.—No. 265.—The following temporary promotions are made in the Forest Department, with effect from the 1st July 1893, the date of Mr. Calthrop's transfer to Barar:—

Mr. W. W. T. McHarg, Assistant Conservator, 1st grade, to officiate as Deputy Conservator, 4th grade.

Mr. G. R. Long, Assistant Conservator, 2nd grade, to officiate as Assistant Conservator, 1st grade.

No. 266.—With reference to section 79 of the Upper Burma Forest Regulations, 1887, as amended by Regulation VIII of 1890, the Chief Commissioner makes the following rule as to the circumstances under which persons may be required to bind themselves by instruments to fulfil certain obligations. This rule shall be read as rule 72 of the rules under the said Regulation

72. Any person applying for a license or permit to fell or remove timber or to collect or remove forest produce, may be required (before such license or permit is issued to him) to enter into a bond binding himself to observe the conditions of such license or permit, and covenanting that he and his servants and agents will abstain from the acts prohibited by the Upper Burma Forest Regulations, 1887, the rules made thereunder, and any acts specifically prohibited by the license or permit or bond.

24th July, 1893.—No. 267.—Mr. C. W. B. Anderson, Extra Assistant Conservator of Forests, is transferred from the charge of the Paungbyin Revenue station, Upper Chindwin Division, to the Yaw Forest Division.

18th July, 1893.—No. 7.—Mr. G. R. Long, Assistant Conservator of Forests, made over, and Mr. T. A. Hauxwell, Deputy Conservator of Forests, received charge of, the Agency Division on the afternoon of the 17th July 1893.

21st July, 1893.—No. 14.—With reference to Revenue Department Notification No. 200 (Forests), dated 8th June 1893, the Deputy Conservator of Forests, Minbu division, and the officiating Deputy Conservator of Forests, Yaw division, respectively made over and received charge of the Zigat Revenue station on 14th July, before noon.

28th July, 1893.—No. 271.—Under the provisions of Article 291 of the Civil Service Regulations, privilege leave for 20 days is granted to Mr. W. F. L. Tottenham, officiating Deputy Conservator of Forests, with effect from the 31st July 1893, or the subsequent date on which he may avail himself of it

29th July 1893.—No. 272.—In exercise of the powers conferred by section 19 of the Upper Burma Forest Regulation, 1887, The Chief Commissioner revises the arrangement in respect of taungya cultivation made by Revenue Department Notification No 300, dated the 7th December 1891, by cancelling the permission granted thereby to certain inhabitants of Lsdagyi village to practise taungya cultivation within the Palwe reserve.

1st August, 1893.—No. 279.—Under the provisions of Articles 277 and 291 of the Civil Service Regulations, privilege leave for three months and fifteen days is granted to Mr. C. L. Toussaint, officiating Deputy Conservator of Forests, with effect from the 1st August 1893, or the subsequent date on which he may avail himself of it.

No. 280.—Mr. H. H. Forteach, Assistant Conservator of Forests, is transferred from Mandalay to the charge of the Yaw Forest division during the absence on privilege leave of Mr. C. L. Toussaint, or until further orders.

1st August, 1893. No. 272.—In exercise of the powers conferred by sections 33 and 34 of the Upper Burma Forest Regulation, 1887 the Chief Commissioner makes the following alterations in the forms of licenses prescribed in Revenue Department Notification No. 140 (Forests), dated 19th April 1893 :—

(1) For conditions (1) and (2) to Appendix IX substitute the following :—

“(1) That the licensee or any one employed by him shall not fell or cut any catechu tree of less than 3 feet in circumference at 1 foot from the ground level, and shall not remove, chip, boil, or otherwise utilize the wood of any such tree that may have been felled by any other person, except with the written permission of a Forest Officer of not lower rank than an Extra Assistant Conservator of Forests.”

“(2) That, if stumps of catechu trees of less than 3 feet in circumference are found in the vicinity of the catechu-boiling camp in which the holder of this license is working, and if there is reasonable proof from the dragging tracks on the ground that the trees cut from such stumps have been hewn into logs and taken to the said camp, this license shall be liable to confiscation by order of the Forest Officer

in charge of the division, or of any Forest Officer of not less rank than an Extra Assistant Conservator within whose jurisdiction the camp is situated."

(ii) in condition (4) of Appendix IX omit words "*for each cauldron*" wherever they occur.

(iii) In condition (2) of Appendix IX omit the words "*for each cauld*"

(iv) In Appendix XII omit the words "*or collect resin*" in the heading and in the first line of the form.

(v) In clause (i) of Appendix XII for "*exclusion*" read "*exclusive right*."

Substitute the following for the heading of Form :—

"*License to collect myrabolams, indur, puenyet, honey and wax, lac, thanatka bark, or shaw fibre.*"

2nd August 1893 No. 285.—Under the provisions of Articles 277 and 282 (a) (1) of the Civil Service Regulations, privilege leave for three months and 15 days is granted to Mr. T. H. Aplin, Deputy Conservator of Forests, with effect from the 5th August 1893, or the subsequent date on which he may avail himself of it.

No. 286.—Mr. H. N. Thompson, Assistant Conservator of Forests, is transferred from the Mingin subdivision, Lower Chindwin division, to the charge of the Upper Chindwin Forest division.

No. 287.—Mr. C. W. A. Bruce, Assistant Conservator of Forests, is transferred from the Upper Chindwin to the charge of the Lower Chindwin Forest division.

2nd August 1893 No. 15.—Under section 43 (2) of the Upper Burma Forest Regulation, 1887, Myingyan, on the Irrawaddy river, is hereby declared to be a station for the reception of drift timber within the jurisdiction of the Officer in charge of the Yaw Forest division.

7th August 1893. No. 16.—With reference to Revenue Department Notification Nos. 279 and 280, (Forests), dated the 1st August 1893, Mr. C. L. Toussaint, Deputy Conservator of Forests, availed himself of the three months and 15 days' privilege leave granted to him and made over charge of the Yaw Forest division to Mr. H. H. Forteach, Assistant Conservator of Forests, on the forenoon of the 1st instant.

8th August 1893. No. 17.—Mr. T. H. Aplin, Deputy Conservator of Forests, Lower Chindwin division, availed himself, on the forenoon of the 5th August 1893, of the three months and 15 days' privilege leave granted him in Revenue Department Notification No. 285 (Forests), dated the 2nd August 1893.

No. 18.—With reference to Revenue Department Notification No. 287 (Forests), dated the 2nd August 1893, Mr. T. H. Aplin, Deputy Conservator of Forests, made over, and Mr. C. W. A. Bruce, Assistant Conservator of Forests, assumed charge of, the Lower Chindwin division on the forenoon of the 5 instant.

No. 19.—With reference to Revenue Department Notification No. 286 (Forests), dated the 2nd August 1893, Mr. C. W. A. Bruce, Assistant Conservator of Forests, made over, and Mr. H. N. Thompson, Assistant Conservator of Forests, assumed charge of, the Paungbyin subdivision, Upper Chindwin Forest division, on the afternoon of the 27th July 1893, and of the Upper Chindwin Forest division on the afternoon of the 26th July 1893.

15th August 1893. No. 10.—With reference to Revenue Department Notification No. 291F., dated the 28th July 1893, Mr. W. F. L. Tottenham, officiating Deputy Conservator of Forests, availed himself of the privilege leave granted him therein in the forenoon of the 31st July 1893.

16th August 1893. No. 11.—Mr. W. F. L. Tottenham, officiating Deputy Conservator of Forests, reported his return to duty on the forenoon of the 15th August 1893, from the privilege leave granted him in Revenue Department Notification No. 291, dated the 28th July 1893.

10th August 1893. No. 20.—With reference to Revenue Department Notifications Nos 286 and 287 (Forests), dated the 2nd August 1893, Mr. H. N. Thompson, Assistant Conservator of Forests, made over, and Mr. C. W. A. Bruce, Assistant Conservator of Forests, assumed charge of, the Mingin subdivision, Lower Chindwin division, on the forenoon of the 27th July 1893, in addition to his other duties.

12th August 1893. No. 21.—With reference to Revenue Department Notification No. 267 (Forests), dated the 24th July 1893, Mr. C. W. B. Anderson, Extra Assistant Conservator of Forests, attached to the Yaw Forest division for general duty, reported his arrival at Pakókku on the afternoon of the 22nd July 1893.

9—ASSAM GAZETTE.

11th August 1893. No. 8039G.—In consequence of the return from privilege leave of Mr. J. A. McKee, officiating Conservator of Forests, Assam, the following reversions are notified with effect from the 8th August 1893,—

Mr. R. H. M. Ellis, Officiating Conservator of Forests, Third Grade, to be Deputy Conservator of Forests, First Grade (provisional).

Mr. J. L. Pigot, Officiating Deputy Conservator of Forests, First Grade (provisional), to be Deputy Conservator of Forests, Second Grade (provisional), and to be seconded.

Mr. D. P. Copeland, Officiating Deputy Conservator of Forests, First Grade (provisional), to be Deputy Conservator of Forests, Second Grade (provisional).

Mr. H. G. Young, Officiating Deputy Conservator of Forests, Second Grade (provisional), to be Deputy Conservator of Forests, Third Grade (provisional).

Mr. T. J. Campbell, Officiating Deputy Conservator of Forests, Third Grade (provisional), to be Deputy Conservator of Forests, Fourth Grade.

14th August 1893. No. 8068G.—Babu Jogesvar Sur, Extra Assistant Conservator of Forests, Third Grade, is reduced to the Fourth Grade of Extra Assistant Conservator with effect from the 17th July 1893, and is attached as subdivisional officer in charge of the Nowgong Forest Division under the orders of the Deputy Conservator of Forests, Darrang.

18th August 1893. No. 8226G.—Privilege leave of absence for five weeks, under articles 277 and 291 of the Civil Service Regulations, is granted to Mr. R. H. M. Ellis, Deputy Conservator of Forests, with effect from the 8th August 1893.

10.—HYDERABAD RESIDENCY GAZETTE.

2nd August 1893. No. 230 Mr. L. K. Martin is appointed as Extra, Assistant Conservator of Forests, 4th grade, with effect from the 24th July 1893.

So much of *Residency Orders* Notification No. 256, dated the 24th August 1893, as relates to the pay of Mr. Martin, as well as *Residency Orders* Notifications No. 291, dated the 22nd September 1893, and No 120, dated the 1st May 1893, are hereby cancelled.

2nd August 1893. The position of the officers of the lower controlling staff of the forest service in the Central Provinces, Berar and Coorg, stood as follows on the 25th August 1892 :—

For details see Central Provinces Gazette Notification No. 3982 of 23rd August 1893.

VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—GAZETTE OF INDIA.

20th September, 1893.—No. 994-F.—Furlough for two years under Article 371 (b) of the Civil Service Regulations, is granted to Mr. J. Ballantine, Deputy Conservator of Forests, 3rd grade, Berar, on deputation to His Highness the Nizam's Dominions, with effect, from 16th June 1893. Mr. Ballantine availed himself of subsidiary leave from 10th to 15th idem, both dates inclusive.

2.—BOMBAY GAZETTE.

24th August, 1893.—Mr. G. R. Dabholkar delivered over and Mr. J. P. Orr, I. C. S., received charge of the offices of Forest Settlement and Demarcation Officer, East and West Thána, on the 21st instant in the forenoon.

31st August, 1893.—No. 6322.—Mr. L. S. Osmaston, Assistant Conservator of Forests, First Grade, has been allowed by Her Majesty's Secretary of State for India an extension of extraordinary leave on medical certificate without pay for three months.

2nd September 1893.—No. 6376.—Mr. V. D. P. Rebeiro, L. C. E., Extra-Assistant Conservator of Forests, Fourth Grade, and Sub-Divisional Forest Officer, Bassein, is allowed privilege leave of absence for two months.

4th September, 1893 —No. 6392.—His Excellency the Governor in Council is pleased to appoint Mr. Hasan Ali Muhammad Ali to act as Extra-Assistant Conservator of Forests, Fourth Grade, during the absence of Mr. V. D. P. Rebeiro, L. C. E., on privilege leave, or pending further orders.

8th September, 1893.—Mr. A. N. Master, L. C. E., Extra Assistant Conservator of Forests, Fourth Grade, and Shahapur Sub-Division Officer, delivered over, and Mr. K. B. Phadke, Extra Assistant Conservator of Forests, Fourth Grade, and Kalyán Sub-Division Officer, received charge of the Sháhápúr Sub-Division Office on the 2nd of September 1893, in the afternoon.

11th September, 1893.—Mr. W. F. D. Fisher, Assistant Conservator of Forests, Second Grade, and Divisional Forest Officer, Panch Maháls, and Mr. A. N. Master, L. C. E., Extra Assistant Conservator of Forests, Fourth Grade, delivered over and received charge of the Divisional Forest Office, Panch Maháls, on the 4th instant, in the afternoon.

13th September, 1893.—No. 6660.—Mr. W. R. Woodrow, Deputy Conservator of Forests, Third Grade, and Divisional Forest Officer, Dhárwár, is allowed privilege leave of absence for two months and seventeen days from 20th September 1893, or such subsequent date as he may avail himself thereof.

19th September, 1863.—No. 9750.—Mr. E. G. Oliver, Divisional Forest Officer, West Khándesh, was in charge of the East Khándesh Division, in addition to his own duties, from 22nd May to 19th June 1893, during the absence of Mr. R. H. Madan on leave on medical certificate.

3.—MADRAS GAZETTE.

16th August, 1893.—N. S. Veera Charlu, Forest Ranger, Kurnool District, is granted two months' privilege leave on medical certificate from the date of relief.

18th August, 1893.—The following Forest subordinates of the Northern Circle have passed the Departmental Examination in Law, Code and Accounts held on 17th July, 1893 :—

S. Eggia Narayana Sastri, Forester, First Grade, Anantapur, in Forest Law.

Syed Yasim Sahib, Forester, Fourth Grade, Kurnool.

L. Venkanna, Forester, Second Grade, Ganjam District.

P. Subba Rao, Forester, Fourth Grade, Kistna District.

Mir Nizam Moideen Sahib, Forester, Fourth Grade, Kistna District.

A. V. Subbarayudu, Acting Forester, Fourth Grade, Kistna District.

Eggia Sastri, Forest Ranger, Fourth Grade, Godavari District, having passed the Handwriting Test, the condition in the Establishment list against his name may be removed.

25th August, 1893.—No. 438.—In continuation of the leave notified at page 382 of Part I of the *Fort St. George Gazette*, dated 29th March 1892, (Notification No. 125), Mr. C. G. Douglas, Deputy Conservator of Forests, has been granted by the Right Honorable the Secretary of State for India an extension of six months' leave on medical certificate, the period subsequent to 12th February 1894 being considered to be extra leave without pay.

31st August, 1893.—No. 453.—Mr. H. J. A. Porter, Deputy Conservator of Forests, Madras, has been permitted by the Right Honorable the Secretary of State for India to return to duty within the period of his leave.

6th September, 1893.—To T. Narayanaaaymy Aiyar, Forest Ranger, Chingleput District, now on transfer to North Arcot District, for three months, from the 2nd instant, under article 369 of the Civil Service Regulations.

8th September, 1893.—Ranger Mr. Thompson, Salem District, will continue to act in the 4th Grade from the 11th July 1893 until further orders, *vice* M. Rama Rao.

7th September, 1893.—A. Eggia Sastri, Forest Ranger, Godavari District, is granted an extension of ten days, in continuation of twenty days' leave granted in Office Order No. 43, of 1893-94.

8th September, 1893.—No. 458,—

No.	Name and designation of Officer.	Present grade.	Grade to which promoted.	Nature of promotion.	Remarks showing cause of vacancy, &c.
1	Mr. H. A. Gass, Deputy Conservator of Forest.	Second Grade and acting First Grade.	Conservator of Forests, Third Grade.	Acting . .	During the absence of Mr. Cherry on privilege leave or until further orders.

No. 459.—

No	Name of Officer.	District.	Nature of charge	Remarks.
1	Mr. H. A. Gass ...	Southern Circle.	Conservator of Forests.	Acting, <i>vice</i> Mr. Cherry.
2	Mr. H. A. Gass ...	North Coimbatore Division.	District Forest Officer.	To join on the expiration of his acting appointment as Conservator.
3	Mr. W. C. Hayne ...	Chingleput	Do.	To join on relief by Mr. Porter.
4	Mr. H. J. A. Porter	Trichinopoly <i>cum</i> Tanjore.	Do.	To join on return from leave.

8th September, 1893.—No. 468.—Mr. W. Carroll, District Forest Officer, Chingleput, is granted furlough for one year, with effect from the 15th October, 1893, under article 371 of the Civil Service Regulations.

No. 469. Mr. J. W. Cherry, Conservator of Forests, Southern Circle, is granted privilege leave for two months, with effect from or after the 24th September 1893, under article 291 of the Civil Service Regulations.

16th September, 1893.—Ranger James Tapp, North Arcot District, is granted three months' privilege leave, under article 291 of the Civil Service Regulations, from the date of relief.

4.—BENGAL GAZETTE

22nd September, 1893 No. 4027.—Babu Kedar Nath Mozumdar, Officiating Extra Assistant Conservator of Forests, 4th grade, is confirmed in that grade, with effect from the 15th November, 1892.

5.—N.-W. PROVINCES AND OUDH GAZETTE.

30th August, 1893.—No. 2533.—Mr. L. Mercer, Deputy Conservator of Forests, in charge of the Gorakhpur Forest Division of the Oudh Circle, special leave on urgent private affairs for four months, with effect from the 1st September 1893.

12th September, 1893.—No. 2651.—Mr. E. A. Down, Deputy Conservator of Forests, on return from furlough, to the charge of the Bundelkhand Forest Division of the Central Circle.

12th September, 1893.—No. 2652.—Mr. A. G. Hobart-Hampden, Deputy Conservator of Forests, from the Naini Tal to the Kumaun Forest Division of the Central Circle.

12th September.—No. 2653.—Mr. F. A. Leete, Assistant Conservator of Forests, in charge of the Kumaun Forest Division, on being relieved by Mr. A. G. Hobart-Hampden, to the charge of the Naini Tal Forest Division of the Central Circle.

12th September, 1893.—No. 2654.—Babu Raghu Nath Pathak, Extra Assistant Conservator of Forests, in charge of the Bundelkhand Forest Division, on being relieved by Mr. E. A. Down, to be attached to the Direction Division of the Central Circle.

12th September, 1893.—No. 2670.—The under-mentioned officers have been granted by Her Majesty's Secretary of State for India permission to return to duty:—

Name.	Service.	Appointment.	Date on which permitted to return.
Mr. A. E. Wild	Forest ...	Conservator of Forests.	Within period of leave.

13th September, 1893.—No. 2674.—Lála Har Swarup, Extra Assistant Conservator of Forests, from the Gorakhpur Forest Division to the Bahraich Forest Division of the Oudh Circle.

20th September, 1893.—No. 2789.—The following temporary promotions and reversions in the Forest Department are notified for general information:—

Entry No.	With effect from—	Consequent on—	Name.	From—	To—
1	2nd September 1893.	Mr. W. Shakspear, on privilege leave.	Mr. F. B. Bryant	Deputy Conservator of Forests, 3rd grade.	Officiating Deputy Conservator of Forests, 2nd grade.
			„ B. A. Rebsch, on privilege leave.	Deputy Conservator of Forests, 4th grade.	Officiating Deputy Conservator of Forests, 3rd grade.
			„ M. Hill	Officiating Deputy Conservator of Forests, 4th grade.	Ditto.
			„ J. C. Tulloch	Officiating Assistant Conservator of Forests, 1st grad.	Officiating Deputy Conservator of Forests, 4th grade.
2	6th September 1893.	Mr. L. Mercer, on special leave.	Mr. A. P. Grenfell	Assistant Conservator of Forests, 1st grade.	Ditto.

6.—PUNJAB GAZETTE.

28th August 1893.—No. 458.—Mr. L. Gisborne Smith, Deputy Conservator of Forests, is granted three months' privilege leave, under Articles 277 and 291 of the Civil Service Regulations, with effect from the 25th September, or such subsequent date as he may avail himself of it.

29th August, 1893.—No. 465.—Bhái Sádhu Singh, Extra Assistant Conservator of Forests, of the Hazára Forest Division, availed himself on the 18th July 1893, of the two months' privilege leave sanctioned with effect from 15th July in Punjab Government Notification No. 426, of the 9th August 1893.

7.—CENTRAL PROVINCES.

7th September, 1893.—No. 4156.—Mr. E Dobbs, L. L. D., Deputy Conservator of Forests, Central Provinces, has been permitted by Her Majesty's Secretary of State for India to return to duty within the period of the leave granted him by Notification No. 3304, dated the 18th July 1893.

No. 4194.—Mr. G. F. Taylor, Deputy Conservator of Forests, Nimar, availed himself, on the afternoon of the 9th ultimo, of the three months' privilege leave granted him by Notification No. 3668, dated the 8th idem, making over charge of his duties to the Deputy Commissioner, Nimar.

No. 4195.—Mr. R. C. Thompson, Extra-Assistant Conservator of Forests, posted to the charge of the Nimar Forest Division by Notification No. 3669, dated the 8th ultimo (since cancelled), assumed charge of the duties from the Deputy Commissioner, Nimar, on the afternoon of the 14th idem.

No. 4196.—Privilege leave for three months, under Article 291 of the Civil Service Regulations, is granted to Mr. A. M. Caccia, Assistant Conservator of Forests, with effect from the date on which he may be permitted to avail himself of it.

No. 4197.—Mr. R. C. Thompson, Extra-Assistant Conservator of Forests, transferred to the Mandla Forest Division under Notification No. 3332, dated the 20th July, 1893, is posted to the charge of the Betul Forest Division.

12th September, 1893.—No. 4290.—Privilege leave for two months, under Article 291 of the Civil Service Regulations, is granted to Mr. J. J. Hobday, Extra-Assistant Conservator of Forests, with effect from the 11th September 1893, or the subsequent date on which he may avail himself of it.

20th September, 1893.—No. 4421.—Mr. H. Moore, Deputy Conservator of Forests, returned from the furlough granted to him by Notification No. 2401, dated the 14th July 1892, and with reference to Notification No. 3644, dated the 5th August 1893, assumed charge of the Bilaspur Forest Division on the afternoon of the 21st ultimo.

8.—BURMA GAZETTE.

25th August, 1893.—No. 331.—Under the provisions of Article 291 of the Civil Service Regulations privilege leave for three months is granted to Mr. T. A. Hauxwell, Deputy Conservator of Forests, with effect from the 14th September, 1893, or the subsequent date on which he may avail himself of it.

19th August, 1893.—No. 325.—In exercise of the powers conferred by section 67 of the Upper Burma Forest Regulation, 1887, the Chief Commissioner directs that in the area occupied by forest plantations and orchards at Bernardmyo and Mogók, in lieu of the fines fixed by section 12 of the Cattle-trespass Act, 1871, the following fines shall be levied for each head of cattle impounded under section 66 of the Upper Burma Forest Regulation :—

	Rs.	A.	P.
For each elephant	10 0 0
For each buffalo	2 0 0
For each horse, mare, gelding, pony, colt, filly, mule, bull, bullock, cow or heifer	1 0 0
For each calf, ass, pig, ram, ewe, sheep, lamb, goat or kid	0 8 0

23rd August, 1893.—No. 7.—Mr. C. W. Allan, Extra Assistant Conservator of Forests, reported his return from the privilege leave granted him in Revenue Department Notification No. 160 (Forests), dated the 27th April 1893, on the afternoon of the 16th August 1893 and assumed charge of the Myadaung subdivision on the same date.

29th August 1893.—No. 335.—In exercise of the powers conferred by section 40 of the Upper Burma Regulation, 1887, the Chief Commissioner directs that the following rule shall be substituted for Rule 36 of the Rules under the Regulation published in Revenue Department Notification No. 140, dated the 19th April 1893.

" 36. No person shall move timber in transit without a pass from the Deputy Commissioner of the district or Forest Officer of the forest division in which the timber is, or from an officer empowered by such Deputy Commissioner or Forest Officer in that behalf, or otherwise than in accordance with the conditions of such pass.

Provided that this rule shall not apply to—

(a) bamboos or firewood in billets.

(b) timber collected under a license granted in accordance with Rule 68."

No. 336.—With reference to Revenue Department Notification No. 335, dated 29th August 1893, the Chief Commissioner directs that the following form of pass for timber shall be substituted for the pass prescribed in Rule 37 of the Rules under the Upper Burma Forest Regulation published in Revenue Department Notification No. 140, dated the 19th April, 1893, and numbered as Appendix XV to those rules.

Timber Removal Pass.

Pass to remove timber has been granted to—

- (1) Owner's name
- (2) Destination.
- (3) Kind of timber.
- (4) Hammer-mark.
- (5) Amount of timber.
- (6) Place at which pass must be presented.
- (7) Amount paid for this pass.
- (8) Date of expiry.

Any one removing timber without a pass in this form is liable to a fine of Rs. 500 and six months' imprisonment.

30th August, 1893.—No. 387.—Mr. C. W. Allan, Extra Assistant Conservator of Forests, is transferred from the Tigyaing subdivision, Katha Forest division, to the Yaw Forest division.

No. 338.—Mr. R. F. Lewis, Extra Assistant Conservator of Forests, Ruby Mines subdivision, is posted to the charge of the Tigyaing subdivision in addition to his other duties.

31st August, 1893.—No. 343.—Mr. A. F. Gradon, Deputy Conservator of Forests, 4th grade, is appointed to officiate as Deputy Conservator, 3rd grade, with effect from the 1st January 1893.

11th September, 1893.—No. 346.—Mr. J. Messer, Assistant Conservator of Forests, is posted to the charge of the Salween-Attaran division of the Tenasserim Forest Circle, and will, until further orders, be in charge of the Agency division, Moulmein, in addition to his other duties.

13th September, 1893.—No. 349.—Mr. W. J. Lane-Ryan is promoted from the 4th to the 3rd grade of Extra Assistant Conservators of Forests, with effect from the 5th May 1893. This promotion is subject to the condition that Mr. Lane-Ryan will revert to the 4th grade if he fails to pass in Burmese by the Higher standard at the departmental examination to be held in November 1893.

14th September, 1893.—No. 352.—The undermentioned officer has been granted extension of leave by Her Majesty's Secretary of State for India :—

Mr. J. Nisbet, Deputy Conservator of Forests, six months' furlough on medical certificate.

20th September, 1893.—No. 363.—Under the provisions of Articles 277 and 282 (a) (1) of the Civil Service Regulations Mr. C. W. B. Anderson, Extra Assistant Conservator of Forests, is granted privilege leave for three months and fifteen days, effect from the 4th September 1893.

21st September, 1893.—No. 364.—The following promotions are ordered in the Forest Department :—

Maung Kale, Extra Assistant Conservator, 3rd grade, to be Extra Assistant Conservator, 2nd grade.

Mr. C. W. Allan, Extra Assistant Conservator, 3rd grade, to be Extra Assistant Conservator, 2nd grade.

9.—ASSAM GAZETTE.

24th August, 1893.—No. 8487G.—Privilege leave of absence for two months, under article 261 of the Civil Service Regulations, is granted to Babu Jogesvar Sur, Extra Assistant Conservator of Forests, with effect from the 17th August 1893.

25th August, 1893.—No. 8488G.—Mr. A. M. Long, Assistant Conservator of Forest, Sihsagar Forest Division, is placed in charge of the Garo Hills Forest Division with effect from the 17th August 1893,

25th August, 1893.—No. 8489G.—Mr. W. F. Lloyd, Deputy Conservator of Forests, Lakhimpur Forest Division, is placed in charges of the Sihsagar Forest Division in addition to his own duties, until further orders.

8th September, 1893.—No. 8932G.—With effect from the 8th August 1893, in consequence of the departure on privilege leave of Mr. E. H. M. Ellis, Deputy Conservator of Forests, First Grade (provisional),—

Mr. J. L. Pigot, Deputy Conservator of Forests, Second Grade (provisional), to officiate as Deputy Conservator of Forests, First Grade (provisional), and to be seconded.

Mr. D. P. Copeland, Deputy Conservator of Forests, Second Grade (provisional), to officiate as Deputy Conservator of Forests, First Grade (provisional), *vice* Mr. J. L. Pigot, seconded.

Mr. H. G. Young, Deputy Conservator of Forests, Third Grade (provisional), to officiate as Deputy Conservator of Forests, Second Grade (provisional).

Mr. T. J. Campbell, Deputy Conservator of Forests, Fourth Grade, to officiate as Deputy Conservator of Forests, Third Grade (provisional).

15th September, 1893.—No. 9114G.—In consequence of the death of Mr. J. C. Kelly, Extra Assistant Conservator of Forests, First Grade, the following promotions are made with effect from the 1st June, 1893.

Babu Upendra Nath Kanjilal, Forest Ranger, Fourth Grade, to be an Extra Assistant Conservator of Forests, Fourth Grade, and to be seconded.

Babu Kripanth De, Forest Ranger, Fourth Grade (provisional), to be an Extra Assistant Conservator of Forests, Fourth Grade (provisional).

11.—MYSORE GAZETTE.

16th September, 1893.—No. 4961.—Under Article 172 of the Mysore Service Regulations, Mr. S. A. Bapu Rao, Assistant Conservator of Forests, doing duty in the office of the Inspector General of Forests, is granted casual leave of absence for 15 days with effect from such date as he may avail himself of the same.

VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—GAZETTE OF INDIA.

12th October, 1893.—No. 1059-F.—Furlough for eight months, under Article 340 (b) of the Civil Service Regulations, is granted to Mr E. P. Dansey, Conservator of Forests, Bengal, with effect from 1st March 1894, or the subsequent date on which he may avail himself of it.

19th October, 1893.—No. 1111-F.—Privilege leave for two months, under Articles 277 and 291 of the Civil Service Regulations, is granted to Mr. J. S. Gamble, Conservator of Forests, School Circle, North-Western Provinces and Oudh, and Director of the Imperial Forest School, Dehra Dun, with effect from 1st November, 1893.

2.—MADRAS GAZETTE.

15th September, 1893.—No. 493.—P. Sadasiva Row, late plantation supervisor, Forest Department, South Arcot District, having been convicted of criminal breach of trust by a public servant and dismissed from his appointment, is hereby declared ineligible for further employment in the public service.

19th September, 1893.—No. 476.—Mr. P. M. Lushington, District Forest Officer, Godavari, is granted furlough on medical certificate for one year, with effect from the 13th instant, under article 840 (a) of the Civil Service Regulations.

23rd September 1893.—No. 482.—

Name of Officer.	District.	Nature of charge.	Remarks.
Mr. A. B. Jackson, Assistant Conservator of Forests, First grade.	Godavari	District Forest Officer.	To join speedily.
Mr. T. N. Hearsey, Extra Assistant Conservator of Forests, Third grade.	Anantapur	Do.	To act until further orders.

29th September, 1893.—No 491.—

Name and designation of Officer.	Present grade.	Grade to which promoted.	Nature of promotion.	Remarks showing cause of vacancy, &c.
Mr. H. B. Bryant, Acting District Forest Officer, South Coimbatore.	Assistant Conservator of Forests, Second grade.	Assistant Conservator of Forests, First Grade.	Permanent	With effect from the 18th July, 1893.

30th September, 1893.—Mr. A. Srinivasa Chamberlain, Forester on Rs 40, South Coimbatore, to be Ranger on Rs. 50.

Mr. A. G. Van Haeften, Ranger on Rs. 100, from Madura to the Nilgiri District. Mr. J. W. Ryan, Ranger on Rs. 50, from Nilgiris to North Malabar.

25th September, 1893.—M. Balaji Singh, Forest Ranger Anantapur District, is granted privilege leave for two months, with effect from the 8th September 1893.

1st October, 1893.—To M. Shamsuddin Sahib, Ranger, 4th Grades Salem District, for six months, from the 7th September 1893, under article 369, of the Civil Service Regulations.

Mr. J Tapp, Ranger, 5th Grade, North Arcot District, to act at Ranger, 4th Grade, from the 7th September, *vice* Ranger M. Shamsuddin Sahib on sick leave.

8th October, 1893.—N. S. Veeracharlu, Forest Ranger, Kurnool, is transferred to Bellary District as a temporary measure—To join at the expiration of his leave.

12th October, 1893.—No. 517.—Mr. T. P. Peake, Deputy Conservator of Forests, Madras, has been permitted by the Right Honorable the Secretary of State for India to return to duty within the period of his leave.

17th October, 1893—Ordered that the following promotions be made with effect from the 7th September :—

1. Ranger N. Balaji Singh to act as Ranger 4th Grade, until 1st December, 1893.

2. Forester T. Arumuga Mudaliar to act as Ranger, 5th Grade, *vice* Mr. Thompson promoted, or until further orders.

3. Forester S. Ramaswami Aiyah to act as Ranger, 5th Grade, until 6th March, 1894.

4. Forester H. P. Ramachendra Mudaliar to act as Ranger, 5th Grade, until 1st December, 1893.

3.—BENGAL GAZETTE.

28th September, 1893.—Messrs W. R. Woodrow and T. R. D. Bell, Deputy Conservators of Forests, respectively delivered over and received charge of the office of the Divisional Forest Officer, Dhárwár on the forenoon of 21st September, 1893.

23rd September, 1893.—Mr. V. D. P. Ribeiro, L.C.E., Extra Assistant Conservator of Forests, Fourth Grade, and Bassein Sub-Division Officer, delivered over and Mr. Husanalli Mahomedalli, acting Extra Assistant Conservator of Forests, Fourth Grade, received charge of the Bassein Sub-Division Office on the 16th of September 1893, before noon

12th October, 1893.—Mr. A. N. Master, Extra Assistant Conservator of Forests, Fourth Grade, and Mr. W. F. D. Fisher, Assistant Conservator of Forests, Second Grade, delivered over and received charge of the Divisional Forest Office, Panch Mahála, on the 5th of October 1893, in the afternoon.

18th October, 1893.—No. 7600.—Mr. B. J. Haselden, Divisional Forest Officer, Kárua (C. D.); passed an examination in Káruaras on 7th October 1893.

18th October 1893.—Mr. K. B. Phadke, Extra Assistant Conservator, Fourth Grade, delivered over and Mr. A. N. Master, L.C.E., Extra Assistant Conservator, Fourth Grade, received charge of the Sháhápur Sub-Division Office on the 9th October 1893, before noon.

4.—BENGAL GAZETTE.

16th October 1893.—No. 4338.—The following changes are ordered in the Controlling Staff of the Bengal Forest Department:—

On being relieved of the charge of the Jalpaiguri Forest Division by Mr. H. H. Haines, Officiating Deputy Conservator of Forests (on privilege leave), Mr. C. C. Hatt, Assistant Conservator of Forests, is attached to the Direction Division for special duty.

On return from the furlough granted to him in Notification No. 704For., dated 9th February 1893, Mr. W. M. Green, Deputy Conservator of Forests, is appointed to the charge of the Kurseong Forest Division.

On being relieved of the charge of the Kurseong Forest Division by Mr. W. M. Green, Deputy Conservator of Forests, Mr. E. E. Slane, Extra-Assistant Conservator of Forests, is attached to the Sundarbans Forest Division.

19th October 1893.—No. 4348.—Mr. W. H. Lovegrove, Officiating Deputy Conservator of Forests, in charge of the Chittagong Forest Division, is granted leave for three months under article 291 of the Civil Service Regulations, with effect from the 17th September 1893, or any subsequent date on which he may have availed, or may avail himself, of it.

19th October 1893.—No. 4349.—Mr. R. Quinnell, Extra Assistant Conservator of Forests, Palamau Division, is transferred to the charge of the Chittagong Forest Division, during the absence on leave, of Mr. W. H. Lovegrove, or until further orders.

Babu Guru Das Chatterjee, Forest Ranger, Koderma Range (Direction Division), is transferred to the charge of the Palamau Division.

5.—N.-W. PROVINCES AND OUDH GAZETTE.

3rd October 1893.—No. 2941.—Mr. E. L. Haslett, Extra Assistant Conservator of Forests, attached to the Naini Tal Forest Division of the Central Circle, privilege leave for one month, with effect from the 15th October 1893.

11th October 1893.—No. 3059.—Mr. B. B. Osmaston, Officiating Deputy Conservator of Forests, in charge of the Bahraich Forest Division, on being relieved by Mr. B. A. Rebsch, to the charge of the Pilibhit Forest Division of the Oudh Circle.

11th October 1893.—No. 3060.—Mr. Keshava Nand, Extra Assistant Conservator of Forests, in charge of the Pilibhit Forest Division, on being relieved by Mr. B. B. Osmaston, to be attached to the Direction Division of the Oudh Circle.

11th October 1893.—No. 3061.—Mr. J. M. Blanchfield, Extra Assistant Conservator of Forests, in charge of the Ganges Forest Division of the Central Circle, on being relieved by Mr. W. Shakespear, to be attached to the Gorakhpur Forest Division of the Oudh Circle.

23rd October 1893.—No. 3255.—Mr. E. L. Haslett, Extra Assistant Conservator of Forests, on return from leave, to be attached to the Direction Division of the Central Circle.

6.—PUNJAB GAZETTE.

22nd September, 1893 —No. 489.—Under the provisions of Section, 2 of the Indian Forest Act VII of 1878, the Hon'ble the Lieutenant-Governor is pleased to appoint the Officer Commanding the Native Cavalry Regiment stationed at Umballa for the time being to be a Forest Officer in respect of Blr Chhapar (or Dhautauri) and Blr Surja which have been declared to be Reserved Forests by Notification No 435, dated 14th August, 1893.

4th October, 1893 —No. 505.—Messrs. F. O. Lemarchand, Deputy Conservator of Forests, and C. Somers Smith, Assistant Conservator of Forests, respectively made over and received charge of the Kangra Forests Division, on the afternoon of the 7th September, 1893, consequent on the former's departure on the privilege leave sanctioned in Notification No. 422, dated the 5th August, 1893.

9th October, 1893.—No. 518.—Mr. G S Hart, Officiating Deputy Conservator of Forests, Simla Hill Tracts Division, is granted 22 days' privilege leave, under Article 291 of the Civil Service Regulations, with effect from the 20th October, 1893 or such subsequent date as he may avail himself of it.

11th October, 1893.—No. 519.—Bhai Sādbu Singh, Extra Assistant Conservator of Forests, returned to duty on the afternoon of the 17th September, 1893, from the privilege leave granted him in Punjab Government Notification No 426 of the 9th August, 1893.

7.—CENTRAL PROVINCES.

2nd October, 1893.—No. 4,600.—Notification No. 4290, dated the 12th instant, granting two months' privilege leave to Mr. J J. Hobday, Extra-Assistant Conservator of Forests, is hereby cancelled at his own request.

10th October, 1893 —No. 4757 —Mr. Mahomed Kadir Baksh, Extra Assistant Conservator of Forests, who was posted to the charge of the Nimar Forest Division by Notification No. 3,943, dated the 22nd August, 1893, assumed charge of his duties from Mr. R. C. Thomson, Extra-Assistant Conservator of Forests, on the afternoon of the 9th ultimo.

17th October, 1893.—No. 4870.—Mr. Syed Ali Muttaki Khan, Senior Forest Ranger, temporarily posted to the charge of the Narsighpur Forest Division, to work under the immediate orders of the Deputy Commissioner, by Notification No. 3946, dated the 22nd August-1893, assumed charge of his duties from Mr. W. King, Deputy Conservator of Forests, on the forenoon of the 11th September, 1893.

17th October, 1893.—No. 4871.—Mr. A. M. F. Caccia, Assistant Conservator of Forests, Betul, availed himself, on the afternoon of the 13th September, 1893, of the three months' privilege leave granted him by Notification No. 4,196, dated the 7th idem, making over charge of his duties to Mr. R. C. Thompson, Extra-Assistant Conservator.

21st October, 1893.—No. 4933.—The Officiating Chief Commissioner is pleased to invest the undermentioned Forest Officers with the powers defined in Section 71, Act VII of 1878 (the Indian Forest Act), to be exercised within the limits of their respective Divisions :—

<i>Name.</i>	<i>Designation.</i>
Mr. A. W. Blunt	... Officiating Deputy Conservator of Forests.
Mr. P. H. Clutterbuck	... Officiating Deputy Conservator of Forests.
Mr. H. S. Ker Edie	... Assistant Conservator of Forests.
Mr. N. C. McLeod	... Extra-Assistant Conservator of Forests.
Mr. J. J. Hobday	.. Extra-Assistant Conservator of Forests.
Mr. Ramchunder Krishna	Extra-Assistant Conservator of Forests.

26th October, 1893.—No. 5,007.—Privilege leave for fourteen days, under Article 291 of the Civil Service Regulations, is granted to Mr. H. A. Hoghton, Deputy-Conservator of Forests. Seoni, with effect from the date on which he may be permitted to avail himself of it.

8.—BURMA GAZETTE.

22nd September, 1893.—No. 368.—The undermentioned officer has been permitted by Her Majesty's Secretary of State for India to return to duty within the period of his leave:—

Mr. J. Copeland, Deputy Conservator of Forests.

23rd September, 1893.—No. 24.—In accordance with the orders passed by the Chief Commissioner, this office Notification No. 23, dated the 11th September, 1893, recording the suspension of Mr. C. W. B. Anderson, Extra Assistant Conservator of Forests, on probation, is hereby cancelled.

25th September, 1893.—No. 8.—Mr. T. A. Hauxwell, Deputy Conservator of Forests, made over, and Mr. J. Messer, Assistant Conservator of Forests, received charge of the Agency and Salween-Ataian divisions, and the Tenasserim Forest Surveys, on the afternoon of the 22nd September, 1893.

26th September, 1893.—No. 370.—The following temporary alterations in rank are ordered in the Forest Department:—

(1). With effect from the 11th July, 1893, the date on which Mr. Branthwaite availed himself of privilege leave:—

Mr. C. W. A. Bruce, Assistant Conservator, 1st grade, to officiate as Deputy Conservator, 4th grade.

Mr. A. M. Burn-Murdoch, Assistant Conservator, 2nd grade to officiate as Assistant Conservator, 1st grade.

(2). With effect from the 31st July, 1893, the date on which Mr. Tottenham availed himself of privilege leave:—

Mr. H. N. Thompson, Assistant Conservator, 2nd, officiating 1st grade, to officiate as Deputy Conservator, 4th grade.

(3). With effect from the 1st August-1893, the date on which Mr. Toussaint availed himself of privilege leave:—

Mr. J. Messer, Assistant Conservator, 2nd, officiating 1st grade, to officiate as Deputy Conservator, 4th grade.

(4). With effect from the 5th August, 1893, the date on which Mr. Aplin availed himself of privilege leave:—

Mr. J. C. Murray, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr. H. Jackson, Deputy Conservator, 4th grade, to officiate as Deputy Conservator, 3rd grade.

Mr. H. H. Forteath, Assistant Conservator, 2nd, officiating 1st grade, to officiate as Deputy Conservator, 4th grade.

(5). With effect from the 15th August-1893, the date on which Mr. Tottenham returned from leave.

Mr. H. H. Forteath, Assistant Conservator, 2nd, officiating Deputy Conservator, 4th grade, to officiate as Assistant Conservator, 1st grade.

2nd October, 1893.—No. 373.—In consequence of the departure on privilege leave of Mr. T. H. Aplin, Deputy Conservator of Forests, Mr. H. Slade, Deputy Conservator of Forests, 2nd, is appointed to officiate as Deputy Conservator of Forests, 1st grade, with effect from the 5th August 1893.

7th October, 1893.—No. 381.—In supersession of this department Notification No. 363, dated the 20th September 1893, and under the provisions of Articles 277 and 282 (a) (1) of the Civil Service Regulations, Mr. C. W. B. Anderson, Extra Assistant Conservator of Forests, is granted privilege leave for three months with effect from the 4th September 1893.

No. 382.—The undermentioned officer has been granted extension of leave by Her Majesty's Secretary of State for India.—

Mr. J. Copeland, Deputy Conservator of Forests, 16 days' extraordinary leave without pay.

12th October, 1893.—No. 384.—The following temporary alterations in rank are ordered in the Forest Department, with effect from the 23rd September 1893, the date on which Mr. Hauxwell availed himself of privilege leave:—

(1) Mr. H. B. Anthony, Deputy Conservator, 4th, officiating 3rd grade, to officiate as Deputy Conservator, 2nd grade

(2). Mr. C. L. Toussaint, Deputy Conservator, 4th grade, to officiate as Deputy Conservator, 3rd grade.

(3) Mr. G. B. Blackwell, Deputy Conservator, 4th grade, to officiate as Deputy Conservator, 3rd grade.

(4) Mr. H. H. Forteath, Assistant Conservator, 2nd, officiating 1st grade, to officiate as Deputy Conservator, 4th grade.

13th October, 1893.—No. 385.—In exercise of the powers conferred by section 34, sub-section (2), clause (h) of the Upper Burma Forest Regulation, 1887, the Chief Commissioner prescribes the following form of license for the assessment and collection of the royalty on jade-stone and amber in supersession of the form numbered as Appendix VIII to the Rules published in Revenue Department Notification No. 140, dated the 19th April 1893.

16th October, 1893.—No. 398.—The undermentioned officer has been granted extension of leave by Her Majesty's Secretary of State for India:—

Mr. H. Carter, Assistant Conservator of Forests, three months' leave on medical certificate.

16th October, 1893.—No. 25.—Mr. C. W. B. Anderson, Extra Assistant Conservator of Forests, is held to have availed himself of the 'three months' privilege leave granted in Revenue Department Notification No. 381 (Forest), dated the 7th October 1893, with effect from the 4th September 1893

19th October, 1893.—No. 404.—Mr. C. W. Palmer, Deputy Conservator of Forests, is reduced to the bottom of the second grade of Deputy Conservators.

9.—ASSAM GAZETTE.

28th September, 1893.—No. 9566G.—In consequence of the return from privilege leave of Mr. R. H. M. Ellis, Deputy Conservator of Forests, First Grade (provisional), the following reversions are notified with effect from the 13th September 1893.

Mr. J. L. Pigot, Officiating Deputy Conservator of Forests, First Grade (provisional), to be Deputy Conservator of Forests, Second Grade (provisional), and to be seconded.

Mr. D. P. Copeland, Officiating Deputy Conservator of Forests, First Grade (provisional), to be Deputy Conservator of Forests, Second Grade (provisional).

Mr. H. G. Young, Officiating Deputy Conservator of Forests, Second Grade (provisional), to be Deputy Conservator of Forests, Third Grade (provisional).

Mr. T. J. Campbell, Officiating Deputy Conservator of Forests, Third Grade (provisional), to be Deputy Conservator of Forests, Fourth Grade.

3rd October, 1893.—No. 9655G.—Furlough for six months, under article 340 (a) of the Civil Service Regulations, is granted to Mr. W. F. Lloyd, Deputy Conservator of Forests, with effect from the 24th September 1893.

6th October, 1893.—No. 9725G.—Mr. R. H. M. Ellis, Deputy Conservator of Forests, on return from privilege leave, is posted to the Lakhimpur Forest Division, and placed in charge of the Sibesar Forest Division in addition to his own duties.

10.—HYDERABAD RESIDENCY GAZETTE.

20th September 1893 —No. 994-F.—Furlough for two years, under Article 371(b) of the Civil Service Regulations, is granted to Mr. J. Ballantine, Deputy Conservator of Forests, 3rd grade, Berar, on deputation to His Highness the Nizam's Dominions, with effect from 6th June 1893. Mr. Ballantine availed himself of subsidiary leave from 10th to 15th idem, both dates inclusive.

11.—MYSORE GAZETTE.

29th September 1893,—No. 6424—G. F. 291-92.—Under Article 173 of the Mysore Service Regulations, Mr. B. Ramswami Iyer, Sub-Assistant Conservator of Forests, Kadur District, is granted casual leave of absence for 15 days with effect from such date as he may avail himself of the same.

2. During the absence on leave of Mr. Ramswami Iyer, the following arrangements are ordered :—

- (i) Mr. B. Hua Singh, Forest Probationer, to be in charge of the Forest Department of the Kadur District, until further orders.
- (ii) Mr. M. G. Rama Rao, Forest Probationer, to be in charge of the Shikarpur Forest Sub-Division.
- (iii) Mr. Appalya, Forest Probationer, is transferred from the Mysore to the Shimoga District.

IX.—EXTRACTS FROM OFFICIAL GAZETTES.

2.—MADRAS GAZETTE.

23rd October 1893.—No. 538.—M R. Ry. V. Alwar Chetty Garu, B. A., Extra Assistant Conservator of Forests, is granted privilege leave for one month, in extension of the leave for one month granted by the Board of Revenue, under article 291 of the Civil Service Regulations.

4th November 1893.—No. 540.—

No	Name and designation of officer.	Present grade.	Grade to which promoted or reverted.	Nature of promotion or reversion.	Remarks showing cause of vacancy, &c.
1	Mr. A. W. Lushington	Acting Deputy Conservator of Forests, Second Grade.	Deputy Conservator of Forests, Third Grade.	Permanent.	With effect from 10th October 1893.
2	Mr. H. J. A. Porter.	Deputy Conservator of Forests, Third Grade	Deputy Conservator of Forests, Second Grade.	Acting.	

No 541.—

No.	Name of officer.	District.	Nature of charge	Remarks.
1	Mr. T. P. Peake ...	Madura ...	District Forest Officer.	To join on return from leave.

13th November 1893.—Mr. F A. Lodge, Deputy Conservator of Forests, Madras, has been permitted by the Right Honorable the Secretary of State for India to return to duty within the period of his leave.

23rd November 1893.—No. 567.—Mr. J. T. Lever, Forest Settlement Officer, Kurnool, &c., Districts, is granted privilege leave for three months, under article 291 of the Civil Service Regulations.

3.—BOMBAY GAZETTE.

30th October 1893.—No 7,981.—His Excellency the Governor in Council is pleased to appoint—

Mr. H. W. Keys, on return from leave, to do duty as Divisional Forest Officer, Khandesh ;

Mr. E. G. Oliver to do duty as Divisional Forest Officer, Sholapur.

31st October 1893.—No. 8007.—Mr. Bhagvandas Harkisondas Dalal, Extra Assistant Conservator of Forests, West Khandesh, passed an examination in Maráthi according to the Higher Standard on the 12th October 1893.

31st October 1893.—No. 8008.—Rao Saheb Annaji Balaji Pandit, Head Accountant, Surat, passed the prescribed examination in Accounts on the 10th October 1893.

31st October 1893.—No. 8009.—Mr. Bhagvandas Harkisandas Dalal, Extra Assistant Conservator of Forests, West Khandesh, passed with credit on the 12th October 1893 the examination prescribed in Rule, 6 of the Rules published in Government Notification No. 2878 dated 4th June 1880, for the examination of Forest Officers.

2. Mr. Dalal passed the examination in subject No. 1 in Maráthi.
25th October 1893.—Mr. G. J. Rege, Acting Extra Assistant Conservator, delivered over and Mr. Robinson, Extra Assistant Conservator, received charge of the Sub-Divisional Office, Kolaba, on the 10th October, 1893, before office hours.

10th November 1893.—Mr. G. P. Millet, Deputy Conservator of Forests, Fourth Grade, and Mr. T. B. Fry, Deputy Conservator of Forests, Second Grade, respectively delivered over and received charge of the Divisional Forest Office, Working Plans, N. C., on the 6th of November 1893, before noon.

12th November 1893.—Messrs. T. R. D. Bell and H. Mainwaring respectively delivered over and received charge of the Divisional Forest Office, Bijapur, in the afternoon of 1st November 1893.

12th November 1893.—Mr. Mainwaring relinquished charge of the Divisional Forest Office, Working Plans' Party I, Southern Circle, to Mr. C. M. Hodgson in the afternoon of the 1st November 1893.

Messrs. Hodgson and Bell respectively delivered over and received charge of the Divisional Forest Office, Working Plans Party II, Southern Circle, in the afternoon of the 1st November 1893.

17th November 1893.—Mr. T. R. D. Bell, Deputy Conservator of Forests, delivered over and Mr. W. A. Talbot, Divisional Forest Officer, Northern Division of Kanara, received charge of the Divisional Forest Office, Dharwar, on the afternoon of the 3rd November 1893.

23rd November 1893.—Mr. Hasanali Mahomedali, acting Extra Assistant Conservator of Forests, and Mr. V. P. Rebeiro, Extra Assistant Conservator of Forests, respectively delivered over and received charge of the Bassein Sub-Division Office on the 16th November, before noon.

27th November 1893.—No. 8763.—Mr. L. S. Osmaston, Assistant Conservator of Forests, First Grade, has been allowed by Her Majesty's Secretary of State for India to return to duty within the period of his leave.

4.—BENGAL GAZETTE

28th October 1893.—No. 4894.—Mr. F. Trafford, Assistant Conservator of Forests, who was granted leave for six months on medical certificate under the orders contained in the Notification No. 2375 For. dated the 24th June, 1893, has been granted an extension of leave for three months by the Secretary of State for India.

6th November 1893.—No. 4508.—Mr. C. A. G. Lillingston, Deputy Conservator of Forests and Personal Assistant to the Conservator of Forests, Bengal, is transferred to the Darjeeling Forest Division for general duty.

13th November 1893.—No. 4626.—Mr. C. O. Hatt, Assistant Conservator of Forests, 1st Grade (provisional), is appointed to officiate in the 4th grade of Deputy Conservators, *vice* Mr. H. H. Haines on privilege leave, with effect from the 24th July 1893 and until further orders.

5.—N. W. P. AND OUDH GAZETTE.

3570

23rd November 1893.—No. 11—851.—Mr. C. C. Abbey, who has been appointed to the Forest Department by the Secretary of State for India, and who reported his arrival in Allahabad on the 22nd November 1893, to be an Assistant Conservator of Forests, 2nd grade, and to be posted to the Kheri Division of the Oudh Circle.

3632

30th November 1893 —No. 11—86A.—The following reversions in the Forest Department are notified for general information :—

Entry number.	With effect from—	Consequent on—	Name.	From—	To—
1	10th October 1893...	Mr. B. A. Rebeck's return from privilege leave.	Mr. M. Hill ... " J. C. Tulloch... " B. A. Rebeck ... " A. P. Grenfell. " F. B. Bryant... " A. G. Hobart-Hampden. " B. B. Ormston	Officiating Deputy Conservator of Forests, 3rd grade. Officiating Deputy Conservator of Forests, 4th grade. Officiating Deputy Conservator of Forests, 3rd grade. Officiating Deputy Conservator of Forests, 2nd grade. Officiating Deputy Conservator of Forests, 3rd grade. Officiating Deputy Conservator of Forests, 4th grade. Officiating Deputy Conservator of Forests, 4th grade.	Officiating Deputy Conservator of Forests, 4th grade. Officiating Assistant Conservator of Forests, 1st grade. Deputy Conservator of Forests, 4th grade. Assistant Conservator of Forests, 1st grade. Deputy Conservator of Forests, 3rd grade. Deputy Conservator of Forests, 4th grade. Assistant Conservator of Forests, 1st grade.
2	1st November 1893.	Mr. E. A. Down's return from furlough.			
3	2nd November 1893.	Mr. W. Shakespear's return from privilege leave.			

3640

30th November 1893.—No. 11—851.—Mr. H. G. Billson, who has been appointed to the Forest Department by the Secretary of State for India, and who reported his arrival in Allahabad on the 30th November 1893, to be an Assistant Conservator of Forests, 2nd grade, and to be attached to the Direction Division of the School Circle.

6.—PUNJAB GAZETTE.

31st October 1893.—No. 541.—Mr. L. Gisborne Smith, Deputy Conservator of Forests, and Bhái Sádhu Singh, Extra Assistant Conservator of Forests, respectively made over and received charge of the Hazára Forest Division on the afternoon of the 25th September 1893, consequent on the former's departure on the privilege leave for three months granted him in Punjab Government Notification No. 458, dated the 28th August 1893.

16th November 1893.—No. 580.—Mr. C. P. Fisher, Officiating Deputy Conservator of Forests, Punjab, is granted privilege leave for three months, under Articles 277 and 291 of the Civil Service Regulations, with effect from the 1st January 1894 or such subsequent date as he may avail himself of it.

21st November 1893.—No. 597.—Messrs G. S. Hart, Officiating Deputy Conservator of Forests, and G. G. Minniken, Deputy Conservator of Forests, respectively made over and received charge of the Simla Hill Tracts Division on the forenoon of the 21st October 1893, consequent on the former's departure on the privilege leave granted him in Notification No. 513, dated the 9th October 1893.

28th November 1893.—No. 605.—His Honor the Lieutenant-Governor of the Punjab is pleased to make the following promotion on the amalgamated list of Forest Officers in the Punjab, Central Provinces, Coorg and Berar with effect from the 2nd May 1893:—

Mr. C. Somers Smith, Assistant Conservator, 2nd Grade to be Assistant Conservator, 1st Grade.

Mr. Somers Smith's place on the list will be between Messrs Lowrie and Hart.

7.—CENTRAL PROVINCES GAZETTE.

2nd November 1893.—No. 5121.—On return from the leave granted him by Notification No. 3113, dated the 30th August 1892, Dr. E. Dobbs, M. A., LL. D., Deputy Conservator of Forests, is posted to the Nagpur-Wardha Forest Division.

2nd November 1893.—No. 5122.—Dr. E. Dobbs, Deputy Conservator of Forests, returned from the leave granted him by Notification No. 3113, dated the 30th August 1892, and with reference to Notification No. 5121, dated the 2nd instant, assumed charge of the Nagpur-Wardha Forest Division from Mr. Chander Kumar Chatterji, Extra-Assistant Conservator of Forests, on the forenoon of the 25th ultimo.

2nd November 1893.—No. 5123.—Privilege leave for three months, under Article 291 of the Civil Service Regulations, is granted to Mr. S. G. Pranjpe, Forest Divisional Officer, Damoh, with effect from the 17th October 1893.

2nd November 1893—No. 5124.—On being relieved by Mr. Rind of the charge of the Narsinghpur Forest Division, Mr. Syed Ali Muttaki is posted to the charge of the Damoh Forest Division, to work under the immediate orders of the Deputy Commissioner during Mr. Pranjpe's absence on leave, or until further orders.

2nd November 1893—No. 5125.—Mr. S. G. Pranjpe, Extra-Assistant Conservator of Forests, Damoh, availed himself, on the afternoon of the 16th ultimo, of the three months' privilege leave granted him by Notification No. 5123, dated the 2nd instant, making over charge of his duties to Mr. Syed Ali Muttaki, Senior Forest Ranger.

2nd November 1893—No. 5126.—Mr. M. Muttannah, Extra-Assistant Conservator of Forests, Mandla, availed himself, on the forenoon of the 25th September 1893, of the three months' privilege leave granted him by Notification No. 3944, dated the 22nd August 1893, making over charge of his duties to Mr. W. King, Deputy Conservator of Forests.

2nd November 1893—No. 5127.—On return from the three months' privilege leave granted him by Notification No. 3668, dated the 8th August 1893, Mr. G. F. Taylor, Deputy Conservator of Forests, is posted to the charge of the Saugor Forest Division.

2nd November 1893—No. 5128.—On being relieved of the charge of the Saugor Forest Division by Mr. G. F. Taylor, Deputy Conservator of Forests, Mr. L. A. W. Rind, Deputy Conservator of Forests, is posted to the charge of the Narsinghpur Forest Division.

2nd November 1893—No. 5129.—Mr. G. F. Taylor, Deputy Conservator of Forests, returned, on the 1st ultimo, from the privilege leave granted him by Notification No. 3668, dated the 8th August 1893, and with reference to Notification No. 5127, dated the 2nd instant, assumed charge of the Saugor Forest Division from Mr. L. A. W. Rind, Deputy Conservator of Forests, on the forenoon of the 4th ultimo.

The unexpired portion of his leave is hereby cancelled.

2nd November 1893—No. 5130.—Mr. L. A. W. Rind, Deputy Conservator of Forests, posted to the charge of the Narsinghpur Forest Division by Notification No. 5128, dated the 2nd instant, assumed charge of his duties from Mr. Syed Ali Muttaki, Senior Forest Ranger, on the forenoon of the 10th ultimo.

2nd November 1893—No. 5131.—On being relieved of the charge of the Bilaspur Forest Division by Mr. Blunt, Deputy Conservator of Forests, on return from privilege leave, Mr. H. Moore, Deputy Conservator of Forests, is posted to the charge of the Betul Forest Division.

21st November 1893—No. 5444.—Mr. A. W. Blunt, Officiating Deputy Conservator of Forests, returned from the three months' privilege leave granted him by Notification No. 3851, dated the 1st August 1893, and resumed charge of the Bilaspur Forest Division from Mr. H. Moore, Deputy Conservator of Forests, on the forenoon of the 10th instant.

8.—BURMA GAZETTE.

20th October, 1893.—No. 407.—Under the provisions of Articles 277 and 282 (a) (1) of the Civil Service Regulations Mr. H. N. Thompson, Assistant Conservator of Forests, is granted privilege leave for three months and 16 days, with effect from the date on which he may avail himself of it.

No. 408.—Mr. O. W. A. Bruce, officiating Deputy Conservator of Forests, is appointed to hold charge of the Upper Chindwin Forest division in addition to his other duties till further orders.

21st October, 1893.—No. 409.—Mr. D. L. Richardson, Myoök, is appointed a Forest Settlement Officer to succeed the Deputy Commissioner, Bhamo, for the purpose of the enquiry ordered in this department Notification No. 302, dated the 10th August 1893.

No. 410.—The Forest Officer in charge of the Bhamo Forest division is appointed to be the Forest Officer who shall assist the Forest Settlement Officer in the enquiry ordered in this department Notification No. 302, dated the 10th August 1893.

No. 411.—Mr. D. L. Richardson, Myoök, is appointed a Forest Settlement Officer, to succeed the Deputy Commissioner, Katha, for the purpose of the enquiry ordered in this department Notification No. 366, dated the 22nd September 1893.

No. 412.—Mr. E. A. O'Bryen, Deputy Conservator of Forests, is appointed to be the Forest Officer who shall assist the Forest Settlement Officer in the enquiry ordered in this department Notification No. 366, dated 22nd September 1893.

No. 413.—Mr. D. L. Richardson, Myoök, is appointed a Forest Settlement Officer to succeed the Deputy Commissioner, Katha, for the purpose of the enquiry ordered in this department Notification No. 322, dated the 17th August 1893.

No. 414.—Mr. E. A. O'Bryen, Deputy Conservator of Forests, is appointed to be the Forest Officer who shall assist the Forest Settlement Officer in the enquiry ordered in this department Notification No. 322, dated the 17th August 1893.

No. 415.—Mr. D. L. Richardson, Myoök, is appointed a Forest Settlement Officer to succeed the Deputy Commissioner, Bhamo, for the purpose of the enquiry ordered in this department Notification No. 303, dated the 10th August 1893.

No. 416.—The Forest Officer in charge of the Bhamo Forest Division is appointed to be the Forest Officer who shall assist the Forest Settlement Officer in the enquiry ordered in this department Notification No. 303, dated the 10th August 1893.

No. 417.—Mr. D. L. Richardson, Myoök, is appointed a Forest Settlement Officer to succeed the Deputy Commissioner, Katha, for the purpose of the enquiry ordered in this department Notification No. 323, dated the 17th August 1893.

No. 418.—Mr. E. A. O'Bryen, Deputy Conservator of Forests, is appointed to be the Forest Officer who shall assist the Forest Settlement Officer in the enquiry ordered in this department Notification No. 323, dated 17th August 1893.

20th November, 1893.—No. 9.—Mr. J. Copeland, Deputy Conservator of Forests, reported his return from the leave granted him in Revenue Department Notification No. 382 (Forests), dated 7th October 1893, on the forenoon of the 14th instant.

No. 10.—With reference to Revenue Department Notification No. 455 (Forests), dated the 15th November 1893, Mr. C. R. Dun, Assistant Conservator of Forests, made over, and Mr. J. Copeland, Deputy Conservator of Forests, received charge of the Mandalay Forest division, on the forenoon of the 17th instant.

15th November, 1893—No. 98.—Mr. C. W. Palmer, Deputy Conservator of Forests, made over charge of Minbu Forest division preparatory to availing himself, on the afternoon of the 8th November 1893, of the one year's furlough granted him in Revenue Department Notification No. 440 (Forests), dated the 4th instant.

No. 29.—With reference to Revenue Department Notification No. 441 (Forests), dated 4th November 1893, Mr. C. W. Palmer, Deputy Conservator of Forests, made over, and Mr. A. M. Burn-Murdoch, Assistant Conservator of Forests received charge of the Minbu Forest division, on the afternoon of the 8th November 1893, in addition to his other duties.

20th November, 1893.—No. 30.—Mr. C. L. Toussaint, Deputy Conservator of Forests, reported his return from the three months and 15 days' privilege leave granted to him in the Revenue Department Notification No. 279 (Forests), dated the 1st August 1893, and resumed charge of the Yaw Forest division from Mr. H. H. Forteach, officiating Deputy Conservator of Forests, on the forenoon of the 13th November 1893.

9.—ASSAM GAZETTE.

16th November, 1893.—No. 10964G.—Furlough for one year, under article 371 (a), of the Civil Service Regulations, is granted to Babu Jogesvar Sur, Extra Assistant Conservator of Forests, in commutation of the two months' privilege leave granted in Notification No. 8,487G., dated the 24th August 1893.

APPENDIX SERIES
OF
THE INDIAN FORESTER.

TANS OF SOUTHERN INDIA.

In the course of a recent correspondence with Messrs. Cammiade Brothers, Madras, with reference to the possibility of obtaining a supply of the pods of *Casalpinia digyna* as a tan, I received from them the following interesting letter on the subject of the tanning materials used by them:—

"We use largely the bark of *Cassia auriculata* and myrabolans. The bark of *Cassia Fistula* is also much used in Madras, particularly since a year or so."

"Divi-divi (*Casalpinia coriaria*) is not procurable regularly, so it cannot be relied on for tanning purposes. If it were grown more abundantly, and if the cultivators understood how to pick the pods at the right time, when it is in prime condition, and if they sorted their divi-divi and kept it from rot, this tannin would be valuable for cheap tannages. It is suitable for heavy hides, making very firm leather, but of a dark colour.

"Myrabolans are used principally for colouring skins or hides. Some kinds give a very good colour. It is also used in tanning in a process which consists in sewing the prepared hide like a bag, which is suspended, and in which a decoction of myrabolans is placed, and forced by the pressure of the liquid to percolate through the hide. This is a very inferior tannage, but it is cheap and soon completed. Myrabolans ferment too soon to be of use as other tannins, *e.g.*, the generality of barks.

With wattle* (Nilgiris) we have had no experience. We know that it is very good for heavy hides, and that it makes very firm leather, but of bad colour.

Cassia auriculata bark when cured with care and used within a short time, yields a very fair colour which, however, soon changes into a murky brown. Another great fault is its price. It costs in Madras about ₹20 per candy of 500lbs., whereas a cord of hemlock bark (*i.e.*, a ton) costs from 6 to 10 dollars to tanners in the United States, and for equal quantity of bark used hemlock gives more weight to leather.

"The bark of *Cassia Fistula* is cheap, but it yields leather of a dark colour.

"Colour is of secondary importance in the tannage of heavy hides. It is of paramount importance in the tannage of small hides, and especially of goat and sheep skins. The specialty of Madras is to tan light hides, and goat and sheep skins.

* In the "Révue Agricole," Mauritius, April 1892, the black and golden wattles (*Acacia decurrens* and *A. pyramantha*) are said to be the principal trees which yield tan, and to be quick growers and easily cultivated. It is calculated that 100 acres of wattle plantation will give, in a period of eight years, a net income, after deducting all expenses, of £2,687 or £3-5 per acre per annum. The bark of these wattles is said to contain from 40 to 45 per cent. of tannin.

The wattles cultivated on the Nilgiris are *Acacia dealbata*, *A. decurrens*, and *A. melanoxylon*.

"The pods of *Casalpinia digyna* are said to yield leather as white as snow. If that report is correct, this tannin ought to out out all others in Madras, provided it can be grown cheap. Hence, our desire to experiment with the pods, of which we have been promised a sample through friends at Cuttack."

In a communication to 'Leather,' Mr. Evans, Chemist of the Tanner's Laboratory, Bristol, says that "the pods of a plant from India, which must certainly have been brought to England before, were sent to us as something new. They proved to be the pods of *Casalpinia digyna*, and, presuming they can be cultivated to any extent, the importers may be congratulated on their good fortune. They yield about 33 per cent. of tannic acid, which is in some measure like that of babul (*A. arabica*) pods, which give a cream-coloured precipitate; but this unites with gelatine in the form of a precipitate as white as driven snow, and its reactions with other chemicals give divers colours, which will make it equally attractive to the dyer. In saying this much we can say with satisfaction, as a chemist, that it is almost perfect: what may be its behaviour in the tannery remains to be proved."

In the 'Dictionary of Economic Products' *C. digyna* is described as a prickly tree of the Eastern Himalaya, Eastern and Western Peninsulas, and Ceylon. Dr. McCann, in his 'Dyes and Tans of Bengal,' says that, in Cuttack, the pods of what appears to be this plant are sold as a tan under the name of *kunti*. The word *kunti-paras* would appear to be sometimes, in Orissa, applied to *Butea frondosa*, but incorrectly as *kunti* means tanning pods, and *paras* *Butea frondosa*; in other words, the term *kunti paras* would mean the tanning pods of *Butea*, and not of *Casalpinia*". (L. Liotard.)

INDIAN MUSEUM,
CALCUTTA.

EDGAR THURSTON.



Photo^d by T. H. Hollard

PARIAHS SMELTING WROUGHT IRON SALEBY BISTR CT

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THE IRON-RESOURCES AND IRON INDUSTRIES OF THE SOUTHERN DISTRICTS, MADRAS PRESIDENCY.

I.—MINERALOGICAL AND METALLURGICAL CHARACTERS OF THE ORES.

I give below a list of the principal ores of iron found in Madras, making special mention of the peculiarities in physical characters which these minerals display in this area, and their respective metallurgical importance.—

Magnetite is by far the most abundant of the iron-ores of the area. It occurs either in well defined octahedral crystals which frequently display polar magnetism, imbedded in chlorite-schist, as we find to be the case in the neighbourhood of Rakkivapatti, 11 miles south-west of Salem, and Ettumanikampatti, an *enam* village, a mile further to the south.* These are picked up in large quantities in the rivers after heavy rains, and the Natives, knowing their magnetic properties, string them together as beads. Magnetite occurs, also, making, with quartz, a schist in which the crystals of magnetite are crushed out in the direction of foliation to a rough almond-shape, the proximity of the tapering points giving a lacunar appearance to the rock. Crystals of about one-half to three-quarters of an inch in length, and of this shape, are common in the iron-beds of Kanjamalai and of many other places in the Presidency. All gradations in size are found down to an almost aphanitic rock, in which the constituent minerals are to the naked eye indistinguishable as individual crystals—a type common to most of the groups of iron-beds. Bands of magnetite sometimes alternate with quartz, or bands of quartz and magnetite, rich in the latter mineral, are found alternating with bands of the former, frequently contorted into fantastic patterns, and giving the appearances characteristic of lavas which have cooled down after fluidal movement in a semi-viscous condition. The magnetite and quartz-schists, in common with all the crystalline metamorphic rocks, have, in fact, derived their peculiar flow-structure from actual moulding under the enormous pressures to which they have been subjected during great earth movements. I have noticed that these contorted pieces of magnetite-bearing rock are commonest near the ridges which form such a prominent and characteristic feature in the outlines of hills in which the iron-beds dip at high angles. This, I presume, is not only due to the actual resistance to the disintegrating action of the sub-aerial agents, but also to the tendency to resist jointing, and the consequent production of small fragments which form a more easily moved talus.

The incipient expansion of the mass, accompanying the oxidation and hydration of the magnetite, has, in many places, been sufficient to produce a rock which crumbles under the slightest blow, or even between the fingers; these are the pieces exclusively

* The village of Ettumanikampatti is, curiously enough, named from the octahedra of magnetite,—*Ettu* "eight"; *malu* "bead"; *patti* "village" (Tamil).

used by the Native smelters on account of their friable nature. They are invariably found in the talus at the foot of the hills and probably are simply the more weathered representatives of the compact specimens occurring in the beds above. A further form in which magnetite occurs is that of segregation from the main mass of the rock into cavities and pockets, as innumerable small crystals, which in large fragments frequently exhibit a distinct polarity of magnetism. Magnetite occurs also, together with small crystalline fragments of quartz, felspar, hornblende, garnets, hypersthene and other minerals, as sand in the river beds, being derived from the disintegration of the numerous crystalline rocks within the area. In the trappean rocks, in granites and in the more basic gneisses, magnetite occurs in disseminated grains, but not in quantities sufficient for economic use. In many localities, as in the south of Salem district, a magnet dipped into a bed of river-sand becomes coated with large quantities of magnetic grains.

Magnetite may invariably be distinguished by its hardness. It is **Distinctive characters** always attracted by the magnet and frequently is itself magnetic, with well developed polarity in large specimens. The colour, both in large fragments and in powder, is black, with a well defined metallic or sub-metallic lustre. These properties serve to distinguish it from the other iron-bearing minerals mentioned below. Besides being the most abundant, magnetite is the richest ore of iron,

Metallurgical value of magnetite, containing when pure 72·4 per cent. of pure iron, the remainder being oxygen (Fe_3O_4). The ore which occurs in such abundance in South India is thus the ore which has been used with such success in the Scandinavian iron-works. It was from these ores, smelted with charcoal, that most of the famous Dannemora iron was produced. The Dannemora ore employed yielded on an average below 50 per cent. of the metal, varying between 25 and 60 per cent., whilst, in the Salem district, for example, it is possible to obtain an almost inexhaustible supply of ore with an average of nearly 60 per cent. of iron. This result is calculated from the average mineral composition stated by Messrs. King and Foote, and agrees with rough calculations of my own on crushed samples, as well as the estimate given by Balfour. I have collected a large number of typical specimens, which I hope to subject to analysis, the results of which will be embodied in the final report. I know of no published analyses of these ores giving the results of a search for such impurities as phosphorus, sulphur and manganese; but, from the reputation of the articles of steel which have in times past, been made from the Salem ores by the well-known Arunchella Achari and others, they must have been very free of at least both phosphorus and sulphur.

Very small quantities of *phosphorus*, though variable in its effects in the presence of other elements like carbon and manganese, would be sufficient to render steel distinctly brittle and "cold short".

Phosphorus in steel,

short". In the best American steel rails the phosphorus seldom exceeds 0·1 per cent. and the superiority of tool-steel made from Dannemora iron-ore seems to have been due, in part at least, to the very small percentage of phosphorus, less than 0·03 phosphorus giving the best results. The Dannemora magnetic ore itself appears, from Ward's analyses, to be very free of phosphoric impurities, which are so baneful to the steel-maker. There is one point worthy of consideration in connection with this question, namely the tendency of the phosphorus to pass into a

Dephosphorisation.

basic, scouring, ferriferous slag, whilst a siliceous slag with alkaline earthy bases—desirable, amongst other reasons, for economy of iron—yields most of the phosphorus originally contained in the ore, fuel, and fluxes to the iron. Fluxes are used in most places principally to economise iron in the formation of the fusible silicates of the slag; but in the South of India ores of iron are so plentiful that the

smelters can afford to lose a highly ferriferous slag for the sake of cleansing from phosphorus. Whilst I have no doubt that these facts may account, in some measure, for the purity of the iron and steel produced by the highly wasteful processes of the Native smelters, who use no flux beyond that afforded by the ash of the charcoal employed as fuel, it is still probable that the magnetic ores of the South of India are comparatively free from this impurity.

The presence of minute quantities of *sulphur* in steel is even more powerful in its effects on the properties of the metal than that of phosphorus. An introduction of over 0.05 per cent. of the element is sufficient to render steel sensibly "red-short" or unworkable at a high temperature. These points will receive special attention on chemical examination of the ores used and the iron and steel manufactured by the Natives. It may be remarked that the use of charcoal instead of mineral coal removes one source of contamination with sulphur.

Hæmatite is seldom found in large crystals in this area. In the hills to the south of Namagiripett I found small crystals of specular iron in larger masses of crypto-crystalline hæmatite, forming, with quartz, a schist bedded in conformity to the adjacent magnetite-bearing seams. Frequently we find both magnetite and hæmatite intermixed with quartz, and, in some cases, I have noticed magnetite ores surrounded by hæmatite to varying degrees, producing, in fact, minute crystals of *martite* which are probably, in most cases, pseudomorphic after the magnetic oxide. Hæmatite, when pure, contains 70 per cent. of iron, and is notably free from sulphur and phosphorus. This ore, when smelted, invariably gives a pig rich in silicon—a property which has increased its demand for the production of steel by the Bessemer process; and, before the modification known as the basic process was introduced, only pig-irons rich in silicon were suitable for Bessemer conversion.

Pig-iron from hæmatite for Bessemer conversion.
The ore in this area is quite subordinate in importance to magnetite. From the latter mineral it can be distinguished, when crystallised, by its higher lustre, red streak, crystalline character, and the absence of all magnetic qualities. Hæmatite-schists and gneisses occur in many places in the Presidency. They are found, for example, forming a rich bed on the northern flanks of the Kollimalais, south of Namagiripett in the Salem district, and near Nilambúr and Wandúr in the Ernád talúq of the Malabar district (*vide* Malabar (p. 8)).

Under the action of atmospheric influences, hæmatite takes up water and passes into *turgite* and ultimately into *göthite* and *limonite*, or *brown hæmatite*. These may be carbonated to produce the various forms of *clay-iron-stones* or *chalybite*. Various stages of these processes are represented amongst the Salem iron-ores, especially the production of small quantities of yellow ochre by oxidation and hydration of the magnetite. This is the cause of the friable property of the ore, which is, as before stated, preferred by the Natives. But as none of these ores, however, occur in sufficient quantities to be of any value for metallurgical purposes in comparison to the magnetite and hæmatite, they will receive no further attention.

Intimately connected with the oxidation and hydration of the richer oxides of iron is the formation of *laterite*. This substance, which occurs in enormous quantities over a large part of Peninsular India, contains oxides and hydrates of iron sometimes representing as much as 35 per cent. of the metal. Laterite may be generally described as a porous, argillaceous rock impregnated to varying degrees with peroxide and hydrate of iron, varying in colour from brown,

through shades of red and yellow, to white, and generally mottled by irregular segregation of the ferruginous material. In structure it may be pisolitic, vesicular, or more compact, and sometimes brecciated. Frequently it is traversed by small irregular tubes in different directions. Mr. Lake, who paid especial attention to the characters of this deposit in the Malabar district, noticed that the laterite forming the plateaux was vesicular and probably formed *in situ* by the decomposition of the gneiss. The pelley variety, which is of detrital origin, makes up for the most part the terraces on the hill-sides, whilst the broader valleys are covered with a mixture of vesicular and pelley laterite, which may be partly of detrital origin and partly formed *in situ*.

There is no doubt that in some cases at least laterite has been formed in post-pliocene times. Mr. Foote has described the occurrence of quartzite implements of human manufacture in the so-called low-level laterite of the Madras area, and has shown also that, in number of years, the same laterite must have been very ancient.

Various hypotheses have been put forward to account for the formation of this rock, but probably no one theory can claim exclusive right to the truth. Although it may have arisen from the alteration of various rocks, it is not unlikely that, in all essentials, the process of change is the same in each case. The tendency of iron to segregation is familiar enough to agriculturists everywhere—the formation of the objectionable “iron-pan” in the sub-soil. Hitherto, however, the exact chemical and physical changes by which laterite has resulted from pre-existing rocks have not been satisfactorily traced. Microscopic examination and chemical analysis of isolated constituents might throw some light upon the mass of facts which have been gathered concerning its field-characters.

Laterite, it is stated, has been used for smelting iron; but, as far as the Madras presidency is concerned, I have been unable to confirm this point, the Native smelters everywhere professing ignorance of its use. In the south of India, however, the richer ores of iron are so abundant that there is no reason why laterite should be selected for such a purpose. It is used most extensively as a building stone, and is admirably adapted to the purpose. When freshly quarried it is soft and easily cut into any desired shape, but it consolidates to a firm rock on exposure.

Lithomarge is generally associated with laterite, the parts nearer the surface exhibiting a tendency to concentration of iron and a gradual passage into the latter. Lithomarge varies in colour from various shades of red to almost white, and is, as for example on the Nilgiris, frequently mottled.

Ochres occur in quantity on the Nilgiris, but they have not been used to any extent as pigments.

Pyrites is conspicuously scarce in the crystalline rocks of the south. Finely disseminated grains occur scattered through some of the intrusive igneous rocks, but not large quantities.

Pyrrhotite, or magnetic pyrites, although of interest on account of its remarkable properties, is of no metallurgical value. It occurs in small quantities in some of the rocks of the south as minute hexagonal prisms.

Titaniferous iron-ore.—I have found small crystals of this mineral in some of the eruptive rocks of Salem, but have never noticed it occurring in large quantities. Captain Camp-

Titaniferous.

bell has recorded his discovery of titanium in a black ore used by the smelters of the Salem district, but he gives no particulars as to the quantity or nature of the mineral in which it exists.* Captain Newbold also states that iron-ore, slightly titaniferous, is found over the whole "hypogene area of Southern India."† I have not yet subjected the specimens collected to an analysis; but I hope to give this point due attention, as it is one of metallurgical importance. Although a very refractory mineral, titaniferous

Metallurgical value of
titaniferous.

iron-ore has been used in the bloomery furnaces of the United States and Canada for the manufacture, by direct processes, of wrought iron, and the fine state of division in which the ore occurs as sand is favourable to its treatment by this process. At Mosie in Canada it is found profitable to wash sands, containing only comparatively small quantities of the titaniferous ore, before treatment in, as far as I could learn, the ordinary American Bloomery Furnace with simply a reduction in the slope of the tuyeres and of the pressure of the blast. The mineral is further used with a certain degree of success as lining material in some kinds of revolving puddling furnaces. The titanium itself seems to produce little or no effect on the iron manufactured; it has never been, I believe, found in white pig-iron, and it seems never to pass into the malleable iron made from grey pigs which contain titanium. The action of titaniferous ore is not so much due to the presence in the product of titanium as to the conditions in the blast furnace which are necessitated by the presence in the charge of minerals containing that metal. I do not consider that, with our present knowledge of the uses to which *titanium* can be put in iron-manufacture, the presence of the mineral in Madras to be of immediate value. Although such an authority as David Mushet was so firmly convinced of the value of titanium in steel as to take out thirteen patents for his invention, its value is still an unsettled question, and several chemists have actually declared their inability to find a trace of this element in specimens of Mushet's so-called "titanic steels"‡

Chromite, which has been found in the Salem district, in many respects resembles magnetite, having like it a black colour and sub-metallic lustre. It crystallizes in the same form and has about the same hardness, whilst its specific gravity does not differ from that of magnetite sufficiently to allow of such a means of discrimination between hand-specimens of the two minerals. It is also sometimes magnetic. The property which at once distinguishes it from the magnetic oxide of iron is the colour of its powder: chromite gives a brown streak, whilst that of magnetite is black. In chemical composition it differs from magnetite in a replacement of the iron-sesquioxide wholly or partially by

Chromite,

the corresponding chromic oxide. Besides the value of this mineral for the production of the various chrome-salts used as pigments, its introduction into steel and iron adds to its value on account of its proximity to the rich iron-ores of Salem. Ferro-chrome

Chrome-pigments.

has a decidedly beneficial effect on steel, and only the expense of the ore, and the difficulties attending the smelting of such an easily oxidised metal as chromium, prevent its more extended use in steel-manufacture. It is, however, coming into great favour, especially in Sweden, where the ores of iron are, in many respects, similar to the Indian ores, both in properties and mode of occurrence. In Tasmania, chromic ores containing sulphur have been considerably smelted, although the presence of sulphur necessitates the expensive re-melting of the pig with ferro-manganese. Whilst for rails its price will probably always

Chromium in steels.

* Campbell: *Calcutta Journ. Nat. Hist.*, Vol. II (1842), p. 280.

† Newbold *Journ. Roy. Asiatic Soc.*, Vol. VIII (1844), p. 155, and Vol. IX, p. 40.

prevent it superseding ordinary carbon-steels, the use of chromium-steel for the manufacture of armour-piercing projectiles seems to be decidedly on the increase, and the only substance which seems capable of replacing it to any extent will be a modified form of the remarkable manganese steel recently made by Mr. R. A. Hadfield. For want of available literature I am unable at present to quote any data showing the enormous hardness, tenacity, and great resistance to impact possessed by chromium-steel, but it may with safety be said that the attention which this alloy will in all possibility receive would make its presence in the Salem district a valuable accessory to the iron. In the sequel I shall show that the conditions which invariably accompany deposits of chromite are present not only on the Chalk-hills in Salem, but are repeated in every respect at the foot of Kanjamalai itself—the hill so well-known for its iron-beds from the interesting description by Messrs. King and Foote in the memoir already referred to.

Chromium-steel projectiles.

Hadfield's manganese steel.

Possible occurrence of chromite in Kanjamalai.

II.—DISTRIBUTION AND GEOLOGICAL RELATIONS OF THE ORES.

Since the observations made by Buchanan in 1800, parts of the geological features of Southern India have been described by Heyne, Benza, Newbold, Muzzy, Carter and others; but the principal information we have on the subject is due to the observations made by members of the Geological Survey in 1858, and since that year. The results obtained in the Trichinopoly and South Arcot districts up to 1862 were published by Mr. H. F. Blanford, followed in 1864 by a memoir embodying the extended researches of Dr. W. King and Mr. R. Bruce Foote. Other parts of the Madras Presidency have been at subsequent dates treated in separate memoirs by Dr. King, Mr Foote, and Mr. P. Lake; and in working over the districts so far visited I have been guided by the writings of these gentlemen.

The most valuable, and by far the greater proportion of the iron-ores of the Madras Presidency are found amongst the metamorphic (probably Archæan) rocks, into which are intruded eruptives, varying in composition from siliceous (acid) granites through the variety of "traps" to ultra-basic, olivine-rocks.

Sub-aerial agencies have everywhere made ravages upon the crystalline rocks, and the natural processes of separation of the heavier particles from the lighter have been facilitated by winds and running water. We thus find black sand in the river-beds and on the sea-beaches composed almost wholly of magnetite- and titanoferrite-granules, which the Native smelters collect in places for the manufacture of wrought iron. After a long drought in districts where the soil is comparatively sandy, the wind raises the loose sand into ripples, whilst lines of black material, principally magnetite and hornblende, are strikingly brought out by the removal of the lighter quartzose particles, the process of concentration being aided by the magnetic properties of the granules of iron-ore.

The gneissic rocks of South India include the usual variety of combinations of minerals found in the Archæan areas of North America, Scandinavia, China and other places where these rocks remain exposed. Various modifications of garnetiferous acid gneisses, leptynites, and granulites are associated with various mica hornblende-, chlorite- and talc-schists, quartzites and crystalline limestones. Magnetite and hæmatite occur as normal constituents of this series, forming

Disintegration of crystalline rocks.

Metamorphic rocks.

beds sometimes as much as 100 feet thick, the iron-ore being mixed with more or less quartz, but otherwise free from foreign constituents. These beds are found in various parts of the Presidency, but it is intended in this preliminary report to refer only to those districts which are situated south of latitude 14° N., and I give below a list of these districts with notes on the occurrence of iron-ores in each.

<p>Nodules of clay-ironstone are found amongst the Ariyalūr and Uttattūr beds of the cretaceous system in Trichinopoly, whilst laterite, which contains large quantities of iron, results from the alteration of older rocks, and may have been formed, denuded and re-deposited at different periods (<i>ante</i>, p. 3).</p>	<p>Cretaceous rocks.</p> <p>Laterite.</p>
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ARCOT, NORTH.

Iron-ore, principally magnetic, seems to be obtainable in every talúq, and is found as black sand in many of the river-beds after rains. To the south of Gudiyatam and two and a half miles west of Vellore railway station, beds of magnetic iron-ore occur. Quartzo-ferruginous beds are found in different parts of the Arcot and Wandiwash talúqs. The iron-smelting industry, which is now extinct, was at one time carried on by *pariahs* up to 1855. In describing the manufacture of iron at Yeragutty, near Satghur, Heyne mentioned the occurrence of what he thought might be iserine in the magnetic ore. His description, however, does not strongly support his conclusion. Laterite occurs in abundance and probably extended in former times further into this district.

ARCOT, SOUTH.

Iron-ore was formerly roasted and smelted in this district, especially in the talúqs of Kallakurichi and Trinomalai, where the deposits are richest. Mr. R. Bruce Foote regards the magnetite-beds occurring to the east and north of the Kalrayan hills as unquestionably north-easterly extensions of the great magnetic beds of the Salem district. The monopoly for ore and fuel granted to the Porto Novo Company extended over this district, and the ore used in the furnaces at Trinomalai was obtained about 10 miles west of the factory. According to Captain Benson mining for iron-ore to the depth of 25 feet was carried on in the Kallakurichi talúq in 1855.

CHINGLEPUT.

About one mile south of the Sub-Collector's bungalow, Chingleput, there is a bed of magnetic iron-ore about 3 feet thick, and, according to the evidence of an old cooly, it was worked about ten years ago; traces of the quarrying are still to be seen. Ores occur in smaller quantities in various parts of the district.

COIMBATORE.

Wrought iron of good quality was formerly manufactured from black sand collected in the stream-beds. At the foot of the Anaimalais quantities as large as peas were found by Buchanan. Magnetite of good quality is said to occur in the Kollegal talúq. A bed of very rich magnetite occurs also in the Doddancombai forests of the Satyamangalam talúq. Abundant material for flux could be obtained, if required, from the large formations of crystalline limestone, which, in some places, would also form a handsome marble for ornamental purposes. Kunkur, too, is widely scattered over the district. Manganese has been detected in the black sand from Vkrupáni in the Coimbatore talúq.

MADURA.

According to Balfour, hæmatite, both as specular crystals and in reniform masses; magnetite and other of the iron-bearing minerals of less econo-

mic value have been found in parts of the Madura district. Highly ferruginous laterite, which occurs in abundance, is stated to have been a source of iron in the past. In the Mélor talúq I have obtained magnetic sand in quantity, and from this material iron seems to have been manufactured up to ten years ago in the talúqs of Mélor, Dindigul and Palai. Lumps of iron-slag still found in various places remain as evidence of the old industry, which, however, never was a great success compared with the productions of other districts, especially Salem, whence most of the Native-made iron was introduced for the manufacture of agricultural implements.

MALABAR.

The gneissose rocks of Malabar are not without their iron-bearing beds. Hæmatite-gneiss occurs one mile and a half south-west of Nilambur in the Ernád talúq, and again 6 miles east-south-east of Wandúr there is a garnetiferous rock with bands of hæmatite, whilst about one mile south of Porur, in the same talúq, there are two bands of ferruginous gneiss which have been worked by shafts and galleries. Friable ore is obtained about 9 miles east of Wandur, being worked by the Moplah iron-smelters (*vide infra*, p. 16). Further hæmatite-gneiss is found in the Walluvanad talúq, about 2 miles south-east of Yeddakurichi. Mines are still worked in Nemini and Tachambara amsams of this talúq. The ore in the former locality occurs in the form of well-crystallised magnetite in gneiss. Laterite is used very largely in the Malabar district as a building stone, but I do not think the Natives ever use it as a source of iron. The ore used by the smelters, although frequently found associated with laterite, is in reality a friable quartz-magnetite schist similar in all respects to that used by the kattipariaks of Salem.

The iron-ore used in the Beypore works was obtained in this district from Ferook near Beypore, and from Verkella hill near Calicut.

NELLORE.

Magnetite and hæmatite both occur in this district as members of the eastern band of Mr. Foote's "schistose rocks." The principal magnetic bands have, by the same author, been described under the division Ongole and the Gundlakamma groups. A smaller bed, not included in these groups, is exposed on the left bank of the Man-eru, 3 miles south-west of the Singuraza Konda traveller's bungalow on the north trunk road. In the Ongole group rich beds of iron are found in the Konijedu (Conjadoo) hills, the Ongole hills and Parnametta, 4 miles north-west by west of Ongole. The Gundlakamma group may be divided into four sub-groups, namely, those lying near the village of Burapalle; those lying near the village of Manikesvaran; the beds in the Singirikonda hill, and the Vemparala sub-group.

Hæmatitic schists are found in the Chundi hills, west of the village of Polenane Cheruvu, associated with micaceous and flaggy schists. Laterite is very abundant in this district.

Crystalline limestones occur near Chundi in a bed 4 or 5 feet thick.

NILGIRIA.

Magnetite and hæmatite are found in fairly rich beds in these hills. Mr. H. F. Blanford, who has described the geology of the Nilgiris, says the most important masses of iron-ore occur above the village of Karrachola, a mile and a half west of Kotagiri, and on a small spur of Dodabetta, overlooking the Dhobi's village. Hæmatite is interfoliated with the gneiss about 3 miles east of Jackatalla. As the result of the decomposition of gneiss

in situ, highly ferruginous clays are formed and might be of value as ochreous pigments, but they have not, so far as I could learn, been used for that purpose. Limonite is occasionally found pseudomorphous after pyrites.

The nearest calcareous rock which might be of value as flux, should the Nilgiri ores be worked, is the beautiful, variegated crystalline limestone of the Coimbatore district. Although the price of fuel may be greatly reduced by extended plantations of the blue gum, as Sir D. Brandis has suggested, I do not anticipate that the iron-resources of this district will ever be worth working, at least, on anything like a large scale.

The association of manganese and iron-ores near the lake at Ootacamund and in the Kaiti valley has been mentioned by Benza, Newbold, and others, but the minerals do not appear to exist in large quantities.

SALEM.

The ores of iron, mostly magnetic, of the Salem district, which occur of very good quality, are practically inexhaustible in amount. Throughout nearly all the rocks iron-ore is more or less disseminated; but in places there are beds varying from 50 to 100 feet in thickness of quartz-magnetite schist intercalated with the other metamorphic rocks, exposed for miles across the country and forming a striking and characteristic feature in the scenery.

Mr. Foote has divided the iron-ore beds of Salem into five distinct groups, besides other isolated, but important, beds which will be referred to separately:—

1. *The Kanjamalai group.*
2. *" Godamalai group.*
3. *" Singapatti group.*
4. *" Thalaimalai-Kollimalai group.*
5. *" Thirtamalai group.*

1. *Kanjamalai group.*—In the Kanjamalai, a bold hill, 3,200 feet high, lying 6 miles south-west by west of Salem and near the railway, there are six or seven distinct beds of iron-ore which have weathered out to produce quasi-terraces on the hill-sides, and forming, for a short distance, a synclinal fold, interrupted on the west and north-west side by the intrusion of igneous rocks—quartz, graphic granite and some very interesting representatives of the basic and ultra-basic rocks, with a considerable development of magnesite formed by the decomposition of a rock closely allied to dunite, the chromite-bearing rock of Mount Dun in New Zealand and elsewhere. The magnetite of the iron-beds is mixed with quartz in proportions from about seven parts of the former and one of the latter to a mixture containing about half its bulk of the ore. *Pariah* smelters of Sankaridrug still collect the rotten and friable pieces of ore in the talus at the foot of the hill and on the weathered out-crops of the seam.

2. *Godamalai group.*—Godamalai, with its summit ridge of magnetic iron-ore, forms one of the most striking features of Southern Salem. It rises as a steep hill with a cliff-front dividing the Salem-Attur valley into two. The beds of ore, which contribute so largely to the mass of Godamalai, continue in the north-easterly direction, past Belur to the Naiyamalai, and thence for some miles along the eastern slopes of Tenandemalai. The thickest of the beds measures 100 feet.

3. *Singapatti group.*—To the south of Godamalai there is a synclinal fold with its axis about parallel to the east-north-east and west-south-west strike of the crystalline rocks. To the north of the axis of this fold, thick beds of iron-ore crop out at the surface and may be studied near the road from Valaipadi to M. Illikari. Mr. Foote thinks this group is connected with the Kalrayan beds of South Arcot, which appear also to be continuous with certain

quartzo-ferruginous beds in the Arcot and Wandiwash talúqs of the North Arcot district.

4. *Thalaimalai-Kollimalai group*.—The present iron-smelting *pariahs* of Namagripett obtain their ore from beds included in this group. The deposits of the Thalaimalai in the south of the Námakal talúq and those of the Kollimalais in the talúqs of Námakal and Salem extend for some miles, neglecting local complications, towards the Pachaimalais and into the adjoining district of Trichinopoly.

5. *Thirtamalai group*.—Further to the north of this district, in the Uttankarai talúq, enormous beds of rich iron ore form the ridge of the Thirtamalai and occur again to the east on the banks of the Ponar river.

Besides these groups of deposits, beds of ore isolated, but rich in iron, occur in the Attúr talúq:—

1. Mallikarai hill.
2. Southern flanks of Paithúr-malai.
3. South of Attúr.

A small bed of ore is found also on the southern base of Kheddamala north of Namagripett in the Salem talúq.

In the Salem district there is an abundant variety of minerals and crystalline rocks, including a considerable development of pink and grey crystalline limestones, especially in the southern parts of the district.

Not the least interesting feature in the petrology of this area is the occasional occurrence of magnesite-veins. The most extensive development of this mineral occurs in two patches of about 12 square miles in extent to the north of the town of Salem—the general white appearance of the place having suggested, though in error, the name “Chalk hills.” Magnesite occurs in veins, also, on the north-west side of Kanjamalai and in the same manner at four other places to the south towards the Cauvery. In the two localities which I have examined, the Chalk hills and Kanjamalai, the mineral

Dunite with chromite. is undoubtedly derived from the decomposition of a highly magnesian, ultra-basic, igneous rock which has intruded into the local metamorphics. The original rock was not far removed in character from dunite of New Zealand—a rock composed principally of olivine, with occasional pyroxene, and, as is also the case in the Chalk hills of Salem, chromite. Apart from the chromium the only bases which occur in quantity in dunite are magnesia and iron, and the large proportion of the former base is sufficient to account for the magnesite. Under the microscope the olivine-grains are seen to be cracked in an irregular, but characteristic fashion, and decomposition of the mineral, with formation of magnesite and serpentine, has proceeded along these cracks. Judging from the similarity of conditions, it would not be surprising some day to discover chromite in Kanjamalai and in the other magnesite-bearing localities of this area.

TINNEVELLY.

Lateritic ore and magnetite occur in many places in this district, and from the black sand obtained in the river-beds, iron was formerly smelted in the talúqs of Tenkasi, Nanguneri and Ambasamudram.

TRICHINOPOLY.

Nodes of clay-ironstone obtained from the Uttattúr and from the Ariyalur cretaceous rocks of this district were formerly smelted for iron, and slag-heaps are still found in different parts of the country as evidence of the former industry. Magnetic iron-ores are found as members of the metamorphic series exposed near the Kollimalais and in the Pachaimalais.

These were formerly largely worked, and are still to some extent mined by the *pariahs* of the Musiri talúq. Magnetic sand obtained in the streams of the Marungaparai zemindari has also been worked by the *karumans*.

Pudokotai State.—Magnetic iron-ore occurs among the gneissic rocks of this independent state. A bed exposed one mile north-east of Mallampatti (19 miles north-west by north of Pudokotai) has been described by Mr. Foote.

Travancore State.—Mr. Foote has mentioned the occurrence of slag-heaps indicating a considerable industry formerly in iron smelting which was carried on up to five years ago in the Cunnathúr talúq. The sands of the coast contain, amongst a variety of other minerals resulting from the degradation of the crystalline rocks, considerable quantities of magnetite and titanoferrite. This seems to be true to a certain degree of nearly the whole of the South Indian coast. An interesting series of researches on the magnetism of the iron-bearing beds in Moccoonoomally were described before the British Association in 1860 by Mr. James Broun, but these, except as a record of the occurrence of magnetite in that locality, do not come within the range of the present report.

III.—FUEL SUPPLY.

The scarcity of fuel is the principal, perhaps the only, drawback to the successful development of the iron-ores of the Madras Presidency. The great importance which an accessible supply of coal would possess in an area so rich in iron has doubtless been the cause of the numerous exaggerated accounts and undue expectations which have followed every discovery of carbonaceous material in the south of India. In the districts whose iron resources have been briefly described above the only fossil carbonaceous materials hitherto discovered have been beds of bituminous shale or small deposits of lignite.

The Lower Gondwanas (rocks probably not far removed in age from the European Poikilitic formations), which are the principal coal-bearing strata of India, occur under the

The search for coal, broad alluvial tract of the old Palar river; but, as a result of recent borings, nothing beyond poor bituminous shales have as yet been brought to the surface.

It may safely be asserted that no coal in quantity or quality suitable for iron-smelting has been brought to light in the above-named districts of Madras. If the iron-deposits are ever to be utilised, the only fuel available for that purpose will be charcoal. The future of iron-smelting thus becomes a forest question. Whilst the rich magnetic ores of the Ongole talúq, in the Nellore district, might possibly, from their proximity to the sea and canal, be worked with Singareni coal, the cost of carriage to the western, central and southern districts would be prohibitive for fuel brought from the Central Provinces, Bengal or the Nizam's Dominions.

The iron-industry, which was formerly so extensive, has died out on account of the increasing scarcity of fuel and the importation of cheap iron from England. In several parts of the country we still find slag-heaps standing in evidence of a formerly flourishing industry which is hundreds of years old, and gave employment to large communities of the *karuman* caste and to the out-caste *pariahs*.

The southerly mass of the gháts to the north-north-west of Cape Comorin have been almost denuded of their forests; whilst in the Sivaganga zemindari of Madura, the forests which once proved such an effectual cover for the rebellious Poligars, had, according to Mr. Foote, in 1878, almost disappeared.

Forest area in 1890. In 1890 the following areas were devoted to forests :—

	Square miles.
Reserved forests	5,147½
Leased forests	135½
Reserved lands	11,300
Other forests, Southern Circle	1,240
TOTAL	17,823

The addition "other forests" consists chiefly of new areas selected in Madura for reservation. The above statement excludes 17,957 square miles of unreserved lands under the Forest Act in the Northern Circle. The following table gives the forest area in each district whose iron-resources have been described in the previous pages :—

DISTRICTS.	Reserved and leased forests.	Reserved lands.	TOTAL.
	Sq. mls.	Sq. mls.	Sq. mls.
Arcot, North	430	523	953
Arcot, South	148	662	810
Canara, South	15	940	1,025
Chingleput	126	56	182
Coimbatore	685	1,848	2,533
Madura	379	114	493
Malabar	158	442	600
Nellore	168½	427	595½
Nilgiris	274½	110	384½
Salem	684	570	1,254
Tanjore	9	16	25
Tinnevely	428	162	590
Trichinopoly	141	95	236
TOTAL	3,716	5,965	9,681

During the year 1890-91 the following amounts were felled :—

	Timber.	Fuel.	Bamboo.
	Cubic feet.	Cubic feet.	No.
Northern Circle	2,153,926½	5,413,226	12,092,853
Southern Circle	1,648,571	6,754,989	6,130,594
TOTAL	3,802,497½	12,168,215	18,223,447
Compare 1889-90	3,537,473½	13,219,507	12,694,181

The Salem district, on account of its enormous iron-resources, has always attracted considerable notice. I have, in consequence, thought it advisable to give a detailed account of the supply of fuel available from the forests which are situated within convenient distance of the great iron-ore beds. This information has been collected by Mr. Carroll, late Acting District Forest Officer, and submitted



Photo by H. S. S. S.

PARIAHS MAKING STEEL SALEM DISTRICT

Photo by H. S. S. S.

in a report to the Madras Government (29th January 1892). From this report the following amounts of fuel are, it appears, available in the respective taluqs of Salem, Attúr, Námakal, and Uttankarai :—

Salem talúq.—The 47,800 acres of available forest will give from a clean felling 11,472 tons of timber, which would produce 2,699·3 tons of charcoal, sufficient, probably, to manufacture 830 tons of iron; whilst a partial clearing of the forest would allow of little less than half this yield.

Attúr talúq.—The yield of timber is estimated in the present state of the jungles to be 833 tons per annum—a quantity sufficient only for the manufacture of 58 tons of iron.

Námakal talúq.—In the reserved portions a partial clearing would give 2,816 tons of timber, sufficient fuel, when converted into charcoal, for smelting 220 tons of iron. To this must be added a probable yield of 2,550 tons from the unreserved portions, giving 196 $\frac{1}{2}$ tons of iron.

Uttankarai talúq.—This talúq has an available forest, reserved and unreserved, of 31,946 acres; this amount is within a radius of 5 or 6 miles from the Thirthamalai magnetic iron-beds. The reserved portions would, with clean felling, yield 7,000 to 8,000 tons of timber, and with partial felling, 4,000 tons—equivalent to about 1,000 tons of charcoal. The unreserved portions of 4,100 acres, giving a yield of 2 tons per acre, would, with a 20-year rotation, give only 410 tons of charcoal. Taking these two quantities together, we have sufficient charcoal in Uttankarai to manufacture 433 tons of iron. The jungles lying east-north-east and south of Thirthamalai reserve would on the above rotation yield sufficient charcoal for an additional 192·3 tons of iron.

We thus have in the vicinity of the iron-bearing beds sufficient timber for the following yield of iron per annum :—

					Timber.	Iron.
Salem	talúq	.	.	.	Tons. 5,736	400
Attúr	"	.	.	.	" 833	58
Námakal	"	.	.	.	" 5,366	416
Uttankarai	"	.	.	.	" 8,140	633
TOTAL					" 20,075	1,507

Everywhere, but especially in Salem, the Native smelters exhibited a distinct preference for charcoal made from the wood of *Albissia amara* (*Wunjai* or *Thuringi*, Tamil, and *Oosulay*, Malayalam), a deciduous tree, of moderate size, with a beautifully mottled, hard heartwood and concentric alternating light and dark bands. On account of its strength, this wood is used also for the beams of houses and for carts, whilst the crooked branches are used for ploughs. The tree grows on the plains and slopes of the South Indian hills up to an elevation of 1,000 feet.

Acacia Catechu (the *Karangalli*, Tamil) is also held in high esteem for charcoal manufacture, more especially, however, in North India. It grows in most parts of India and Burma, extending along the Sub-Himalayan tract westwards to the Indus. The heartwood being extremely hard, it is used for all purposes where strength and durability are required.

In Malabar the smelters use charcoal made from the logs and branches of the *Iral* tree (*Xylia dolabriformis*), the wood of which is exceedingly hard and beautifully mottled.

Amongst other good coal-producing woods are the *Sambalichán* (*Sethia Indica*) a hard dark-brown wood, and *Nekani* (*Canthium didymum*), a small tree with hard grey wood.

Colonel Keatinge, when Political Agent of Nimár before 1857, found that the light and soft wood of *Boswellia serrata* (Saler) made excellent charcoal for iron-smelting in the factory established by him in Nimár and worked for some years successfully by a Swedish iron-master.

As to the exact nature of the wood necessary to produce a good charcoal for the smelting furnace, we are as yet comparatively in the dark. By experience the Natives have discovered the preferable qualities of the above-named trees, and of these they exhibit a distinct preference for the *Wunj* and the *Irúl*. The utmost we know of these is that they are all hard close-grained woods; but as to any other properties which give them their excellent charcoal-producing properties, as yet we know nothing. The fact that they are all hard and comparatively slow-growing suggests the conclusion that these are at least desirable properties, probably on account of (1), the firmness of the carbonised product, and (2), the smallness of ash which slow-growing woods generally leave on ignition.

Hitherto the only data of the above nature, as far as I can find, on Indian timbers are the instructive results obtained by Warth's analyses of Dr. H. Warth in the examination of the ash of 20 ashes. woods; but these are principally of more northerly growth*. Although Dr. Warth gives only the amount and composition of ash of these timbers, the results are sufficient to show the wide variation there is between the relative qualities of these timbers as fuels, and, in a

quadruple degree, as charcoal-fuels. *Bauhinia Vahit*, the *Maljhan*, gives an abnormal ash of 11.74 per cent., and its slow-burning properties make it just a convenient log to inspire the story-telling fakír! The ash, of course, not only affects the rate of combustion, but, from the specific heat of the inorganic material, is a considerable source of loss in heat, besides, in iron-smelting, introducing bases which have a decided effect on the quality of the iron and steel produced.

The present yield of wood in the Salem district is undoubtedly quite inadequate to supply the wants of a large iron-manufactory, but though the hills in the immediate vicinity of the iron-beds have become greatly denuded, there are yet, according to Sir Dietrich Brandis, some localities very favourable for forest growth, such as the Kottaipatti valley, south-east of the Thirthamalai, and the slopes of the Godamalai. The northern slopes of the Kollimalais, on the other hand, are very barren. Assuming that an iron-manufactory required

to turn out 10,000 tons of iron a year, for which 35,000 tons of charcoal or 140,000 tons of wood would be required, and taking the average annual yield as half a ton of wood per acre, we should require a forest of 280,000 acres, or 437 square miles, in the immediate vicinity of such a factory. Sir D. Brandis doubts the possibility of obtaining such a yield near the Salem deposits. It seems much more possible to obtain success by multiplying and improving a small type of furnace, as Dr. Warth suggested in 1881, rather than establishing large iron-works such as we have worked by coke in England.†

The luxuriance with which *Casuarina equisetifolia* grows in suitable places exposed to moist sea-air, as on the coast of Nellore, Chingleput, and South Arcot, will possibly, according to Dr. Brandis, be a means of reducing the price of fuel sufficiently for its profitable conversion into charcoal. He makes similar remarks concerning the fast-growing *Eucalyptus* of the hills. Al-

* Manual of Natural Sciences for the use of students in the Forest School, Dehra Dun, Calcutta, 1886, pp. 184, 185.

† The history of previous attempts to smelt iron by European processes in the Madras Presidency is given in a succeeding chapter (chap. V).

though the increased yield per acre of timber available for fuel will undoubtedly bring down the price, I do not think it is so certain that fast-growing trees, like *Casuarina* and the blue gum, will produce timber suitable for charcoal manufacture. Without doubt they would replace, as fuel for the railways and towns, those *hard timbers* which are found to be suitable for charcoal, and so, indirectly, the cost of the carbonised product becomes reduced. From the Administration Report for this year it will be seen that, notwithstanding the comparative failure of the north-east monsoon in the southern districts of Madras, extensive *Casuarina* plantations were made in Chingleput, North Arcot, Trichinopoly and Tanjore.

In his report on the Forest Administration of the Madras Presidency, Sir D. Brandis comes to the following conclusions regarding the iron industries and its fuel supply:—

"Under proper management, the extension of iron-smelting in the Madras Presidency will in no way increase the denudation of the country. On the contrary, it will facilitate the formation, protection, and improvement of the forests.

* * * * *

"In the vicinity of the towns and densely populated tracts the wood of all kinds produced in the protected areas will always find a ready sale as fuel or as timber; but forests must be formed for the sake of their indirect advantages also in the more remote portions of the country, and here, in many cases, the only plan of utilising the abundance of the less valuable kinds will be by means of iron-smelting with charcoal. In some cases the establishment of strictly protected reserves may have tended to extinguish the charcoal iron industry, but where this has been the case, matters have not been managed properly. When such reserves are formed, provision must always be made to supply the requirements of the iron-smelters from the areas left open, until the reserves have been brought to a high state of productiveness.

"The extension of iron-making by means of charcoal will be a great help towards the development of rational forest management in the Madras Presidency. But the Native methods of iron-smelting with charcoal are exceedingly wasteful, and an attempt should be made to introduce an improved method. It is at present generally supposed that the direct system of producing wrought iron from the ore is not capable of considerable improvement. This is a point upon which I am not competent to form any definite opinion. I know, however, that some persons in England, competent to speak on the subject, hold that the direct process is capable of considerable improvement, and that iron-smelting by means of charcoal in India has a great future before it."

IV.—NATIVE PROCESSES OF IRON AND STEEL MANUFACTURE.

The manufacture of iron and steel, for which India has been celebrated for hundreds of years, is still practised in all its primitive rudeness in the southern districts of the Madras Presidency. In Malabar the industry is in the hands of Mahomedan moplabs; in Trichinopoly men of the *Karuman* caste have, until recently, made wrought iron, but are now principally engaged in the production of wootz by the cementation in crucibles of wrought iron imported from the Salem district. In this latter district, and to a smaller extent in the north-west of Trichinopoly, *Kattipariaks* make wrought iron and steel; but the latter is made by an entirely different process from that of the crucible-steel or wootz of the *Karumans*.

MANUFACTURE OF WROUGHT IRON.

Wrought iron is made direct from the ore by smelting with charcoal, the method, though extremely rude in all practical details, being in principle the same as in the Catalan process. Although steel is made, as will be described in the sequel, by the decarburisation of cast iron, I have never come across any case of the indirect production of wrought iron by the removal of carbon, as in the refining and puddling of European "pig" iron. The adoption of the direct process, whether accidental or not, is certainly not without its advantages, and, taking into consideration the materials at the disposal of the Native worker, is perhaps preferable to the preliminary production of highly carburised "pigs," although, on the contrary, he suffers from heterogeneity of product. Iron-ore is so very abundant that he may well despise the addition of fluxes; and the highly ferriferous and basic slag which consequently results has several advantages: (1) It aids in the removal of phosphorus when that element is present in the ore, or, as is sometimes the case, in the charcoal used. (2) The fusibility of the slag dispenses with the necessity of a high temperature for its removal, and thus there is an economy of fuel—the most important of all considerations—and at the same time a safeguard against carburisation. The scouring effect of basic slags on the furnace is quite immaterial to the Native, whose entire 'plant' might be purchased for a few annas, and who breaks down a considerable part of the structure at each operation of smelting a few pounds. As they use neither mineral coal nor pyritous ores there is no fear of the introduction of sulphur. Neither the despised *pariah* nor the prouder, but equally ignorant, caste-man is aware that his ancestors and himself have been for so long a time working a combination of conditions which are comparatively new to western civilisation, and only explained by the recent developments of chemical science.

Malabar.—In the Ernád talúq of this district, magnetite, obtained from a friable, decomposed schist by crushing and washing, is used for the manufacture of wrought iron by the direct process. A large wooden hammer (*multti*) is used for crushing the schist, and the sand so produced is washed in a wooden trough placed in a stream of water which can be regulated at will.

The furnaces are made of a mixture of red clay and sand, and are in all respects built as Dr. Buchanan saw them in 1800.* From the hearth to the throat they measure 10 feet, and the internal horizontal section of each is a rectangle varying in dimensions at different heights. At the throat they measure inside one foot from front to back, and 3 feet from side to side. The widest part of the furnace is about 4 feet from the top, where it measures 3 feet 6 inches from side to side and 2 feet from front to back. From this point the boshes narrow down to the hearth. The side walls are 2 feet thick at the top and extend below into a common platform which joins adjacent pairs of furnaces. The front wall of the furnace is only 3 inches thick, but is strengthened by the insertion of wedges of hardened clay and straw, shaped like 60° set-squares, between the wall itself and the wooden framework which binds the whole furnace together. There are two such frames for binding the upper part made of rods of any convenient kind of wood pinned together at the angles. A third frame, close to the common platform by which the set of furnaces are connected and about 3 feet from the top, is bound to the upright posts which support the roof-like shelter for the whole establishment. The platform referred to, being a solid structure, adds greatly to the strength of the building, and serves as a stand for the man whose duty is to feed the furnace with ore

* Journey from Madras through Mysore, Canara and Malabar. London, 1807, Vol. II, p. 437, and plate xxi.

and fuel. Immediately behind each furnace this structure is hollowed out to form a large ash-pit for the removal of the slag, which trickles out through a hole at the bottom of the furnace and cools as a black, ropy-looking mass like viscous lava. In front of the furnace two small platforms form a support for the four goat-skin bellows arranged in pairs on either side. Each pair of bellows is worked by one man, who is relieved every half hour, and the blast, which is fairly constant, is conducted to the furnace by one clay tuyere from each pair of skins. Between the insertions on the front base of the furnace of the two tuyeres there is a simple row of twelve or fourteen clay-tubes used as peep-holes, whose outer ends are stopped with a daub of wet clay.

In these furnaces a bloom of iron, weighing about 5 cwt., is produced in from forty-eight to sixty hours, and when the process is complete, the lower part of the furnace is broken down, the bloom removed, and allowed to cool for two days, when it is broken into small pieces for the market. The results of my enquiries concerning the cost of working these furnaces were so contradictory that I have had to reject the figures as untrustworthy. The industry is in the hands of Mahomedan moplals, but I was told that the Hindus of the blacksmith caste are more frequently employed in the actual furnace operations.

Salem.—The process adopted by the *pariahs* of this district for the manufacture of wrought iron is, in principle essentially the same as that of Malabar; but the furnace and its appurtenances are much smaller (*see frontispiece*). The Salem furnace is roughly circular in horizontal section, 4 feet high, 2 feet in diameter at the base, and only 9 inches in diameter at the throat. It is divided into two principal parts—(1), a stout base, made of the same kind of red loam, approximately horse-shoe shaped in plan, and 2 or 2 feet 6 inches in height, (2), a chimney-pot top made of clay, which is considered to be superior to that used in the basal structure, but of the same quality as that used for lining the furnace and for the tuyeres. It is invariably impressed in a fanciful pattern with thumb-marks. This upper portion is cemented to the base by a plastering of clay, and in one place, namely at Tukkiampalayam near Valaipadi, this plastering is continued upwards and over the top, thus concealing the chimney-pot entirely from view. When the chimney is fixed, the front opening of the base is plastered up with clay laid upon horizontally-fixed strips of bamboo, and the process is carried downwards until a semi-circular opening is left at the bottom. This hole allows of the removal of the bloom, and serves also for the insertion of the tuyere to convey the blast. The clay-tuyere varies from 6 to 9 inches in length and is slightly widened at the outer extremity for the reception of two tubes of bamboo or sheet iron, each of which conducts the blast from one goat-skin. Preparatory to smelting the furnace is charged with charcoal; and a lighted coal, or red-hot rod of iron is introduced through the tuyere. When the fire has well started, a gentle blast assists the kindling, and ore, previously crushed and moistened with water, is introduced at the throat. Fuel and ore are added from time to time apparently in the most indiscriminate fashion. After about three hours of continuous blast, the tuyere and front part of the furnace are broken out, and the bloom, which weighs from 15 to 20 lb, is removed, hammered to squeeze out the slag and to reduce the irregular mass to a shapely condition, and then split along the middle with an axe, thus laying open the centre to exhibit the quality of the product. One of these blooms brings a price of 4 or 5 annas in the bazaar.

The ore which is used in this very rude process is obtained by grubbing along the slopes of the iron-bearing hills which form such a prominent feature in the Salem topography (*vide pp. 1 and 9*).

The raising and dressing of the ore are carried on in a more wasteful fashion even than the smelting. Only the well disintegrated and rotten

pieces of quartz-magnetite schist are used, whilst all the pieces too hard for easy crushing, even nearly pure magnetite, are rejected, and, consequently, the material contains not only large quantities of quartz grains, which have to be removed in preparing the material for smelting, but, in addition, a considerable amount of limonitic dust, which is also carried away in the subsequent process of cleaning the magnetite.

In dressing the ore the large fragments are brushed with a flat hammer about 3 inches square; one man using the hammer, whilst the other is continuously heaping the larger fragments into the central part of the pile. After sufficient material has been accumulated, the crushed rock is winnowed by pouring out of a basket in a strong wind. The heap which so forms is divided into four portions—No. 1, consisting of large pieces, is to be re-crushed. No. 2 is cleaned of its quartz by sifting in a shallow basket similar to that which is used for separating rice from the husk and for sifting coffee to remove the imperfect berries. Towards the end of the concentrating process the fragments which find their way to the lip of the basket are compound grains of quartz and magnetite; these are dropped back upon the pile for re-crushing, instead of being thrown away with the quartz waste. When the magnetite is well concentrated it is taken in this state to the furnace, but has still to be re-crushed and sifted before it is fit for smelting; this last process, however, is carried on near the furnace. No. 3 of the winnowed pile is composed of *fine* grains of quartz and magnetite, and the concentration is brought about by washing in the

river. The workers are, from practice, evidently aware of the fact that reducing the specific gravity of each mineral by 1 gives the magnetite a greater proportional weight over the quartz, for that of course is the principle on which they adopt washing in preference to sifting for the finer particles. Section No. 4, consisting almost wholly of limonite-dust, is rejected as useless.

Although this industry, compared to its formerly flourishing condition, has greatly diminished, it still affords support to a large number of *pariahs* in the talúqs of Salem, Attúr and Trichengode; whilst in the talúqs of Námakal, Uttankarai and Hosur, where furnaces were until comparatively recently worked, the industry has been abandoned. At most of the places where smelting has been, or is being carried on, I noticed large heaps of ashes and slag, sometimes 10, 15 and 20 feet high, with, in one or two cases, trees of one foot or more in diameter, growing on the heaps.

Smelting has been until very recently, or is now, carried on in the following places in the Salem district, where Dr. Warth and myself found and examined smelters and furnaces:—

(1) SÁLEM TALÚQ.

Námagripatt.—Several slag-heaps and groups of furnaces for the manufacture of both iron and steel. Ore is obtained from one of the outlying low hills of the Kollimalais, about 3 miles south-east of the village. Fuel was obtained from Kadiampatti and Mullu-kurichi forests, about 10 to 12 miles from the furnaces.

Perumapalayam, about 1½ miles north-east of Karipatti.—A large slag-heap and the remains of two or three furnaces. Smelting carried on last a year ago, when ore and fuel were obtained from Godumalai, ½ mile from the village. When the work was in a more flourishing condition, ten years ago, fuel was also obtained from Thaimalai, a distance of 2½ miles.

Tirumanur, 7 miles south of Karipatti.—Ore obtained from 2½ miles north of the village. Charcoal from wood in the forests around the place. One furnace working; the remains of others standing.

From enquiries I heard there were smelters at work in the following additional places in this talúq :

Kongánapuram, 7 or 8 miles west of Kanjamalai, which is the source of the ore.

Vanuvási and *Soragai*, both places near *Nangavalli*, 21 miles north-north-west from Salem *viá* *¶*aramangalam. Twenty or thirty workers are said to be still smelting in these villages.

(2) ATTÚR TÁLÚQ.

Attúr.—A slag-heap, with remains of six furnaces for wrought iron. One for iron and one for steel still at work, owned by one Sanyasi Pariah in Kattayakara Street. Ore is obtained from *Múragathúmalai*, 4 miles west-south-west of Attúr, and fuel from a distance of 6 miles.

Thondaroyapuram or *Meykapalliur*, 4 miles west of Attúr.—Three furnaces, worked for the last time in January, 1892. Ore from *Múragathúmalai*, 1 mile to the south-east. Fuel from same range of hills.

Mathurútú, 3 miles west of Mallikarai.—On account of the present scarcity, work stopped for a month. One smelter was about to make a bloom at the time of my arrival, and, on its completion, I bought it for 5 annas. He said the ore was obtained from the Godumalai and fuel from Poona-malai $1\frac{1}{2}$ miles from the village.

Keerapatti, $\frac{1}{2}$ mile south of Mallikari.—Smelters worked up to February 3rd, 1892; and find it, at this time, more paying to do cooly work, principally in cutting firewood. There were five furnaces on a slag-heap 2 feet high. The work has been carried on in the place a little over two years, the smelters having come from Mathurútú, Nahempatti, and Meykapalliur. Charcoal obtained from *Válákumba*, $2\frac{1}{2}$ miles east. Ore from Nahempatti, 4 miles south.

Nahempatti, on the road to Tammampatti.—Some ore may be obtained close to the village, and more one mile to the east in the Parmamalai. Charcoal from *Taletalai Kaidú*, a distance of 4 miles. Slag-heap, 10 feet high. Banded magnetite-quartz schist is used here for road-metal.

Tammampatti.—Five good furnaces, but none of them worked for nearly six months. Slag-heap, 15 feet high. Ore from Parmamalai $2\frac{1}{2}$ miles north-east of furnaces, the ore which occurs within a mile to the north being neglected. Fuel was obtained from *Válákumba* forest, 2 miles west.

Chendarapatti, 2 miles east of Tammampatti.—One furnace at work. Ore from 5 miles east, *Kudúmalai*. Slag-heap 10 feet high, with remains of four other furnaces.

Tukkiampalayam, 2 miles north of *Valaipádi*.—Three good furnaces and remains of eight others. The only variation I have found in the shape of the furnaces was the use of a square and more strongly built base at this place. Ore brought from the Godumalai in the Salem talúq. Charcoal from 10 miles, according to the statement of the pariahs.

Smelting is not now carried on at *Nérakanar*, 6 miles north-west of Tammampatti and *Kadambér*, 7 miles south of Attúr, localities in which a thriving industry formerly existed.

TRICHENGODE TÁLÚQ.

According to a report from the Deputy Tahsildar of the Sankaridrúg division (dated 9th April, 1892) smelting is still carried on in the following villages:—*Valayasettipalayam*, *Konganapuram*, *Irúqaluruttapalayam*, *Padávedu*, and *Ayigoundenpalayam*. In a few other villages of the same division the industry has only recently been abandoned. For these furnaces supplies of ore have been obtained from Kanjamalai.

The workers unanimously say that the increased price of fuel has been the cause of reducing the industry, and many of the workers have lately stopped on account of the present scarcity and consequent small demand for the iron for implements. Although this cessation of work may be only temporary, it is possible that this might in many of the villages be "the last straw" on a dying industry.

MANUFACTURE OF STEEL.

Steel is made by Natives of South India (1), by the carburisation of wrought iron in crucibles and (2), by the decarburisation of cast iron in an open finery. It is an interesting circumstance that both these general principles, which govern the larger number of processes for the manufacture of steel in Europe and America, have been for so long a time practised in this country and still retain their primitive characteristics. Each method remains the property of a single class, who maintain a rigid exclusiveness in other than metallurgical respects! Although the direct process for smelting wrought iron is known and practised by different castes, the two methods of steel-making have been more carefully preserved, and one might safely assume for them independent origins.

There is no doubt that in each case there is, as a result of the very crude methods employed, a great uncertainty and heterogeneity of product. The crucible-wootz is sometimes, for example, too highly carburised, and at other times is little better than wrought iron. The workers do not now exclusively use wrought iron of their own make; any available waste scrap, English or otherwise, answers their purpose. Three crucibles charged and ready for the furnace I found on opening to contain broken pieces of old Sheffield files with the usual proportions of leaves and wood carefully added. The worker knows, of course, nothing of the principles which govern his art. He only knows that ordinary iron is hardened by fusing with certain "medicines," which, in this case, are *Avaram* wood and leaves. The same blind adherence to method characterises the Salem *pariah*, who decarburises cast-iron shot to produce a substance which turns out to be sometimes almost as brittle as "pig" and sometimes as soft as malleable iron.

It may be remarked at this point that the confusion and disputes as to the method of wootz-manufacture, which one notices in the earlier literature of the various Asiatic societies, seem to have been caused by some of this Salem steel becoming mixed up with the crucible-steel then made in Mysore, South Trichinopoly, and in some other localities. Captain Campbell, for example, in 1842 stated his belief that Dr. Buchanan's account of the manufacture was incorrect and the result of deception on the part of the Natives. From the evidence of several Natives Campbell concluded that the true process was conducted by "fusing together two parts of wrought iron, and one of a kind of cast iron."* This conclusion of Campbell I am unable to confirm in any particular, whilst the description given by Buchanan of wootz-making agrees with the process still practised in the Trichinopoly district. In describing below the manufacture of Salem steel I have mentioned Mushet's surprise at the two kinds of Indian steel brought to England (p. 22).

1. *Crucible steel.*—*Wootz.*—The steel made in crucibles by the carburisation of wrought iron has often been described, and is well enough known, under the name of wootz. But it seems likely that a good deal of the material which has been known in England as wootz, notably that examined by Mushet,† was made by quite a different process, as described below (p. 22) and which has not, so far as I can find, been hitherto described.

* Campbell: *Calcutta Journ. Nat. Hist.*, Vol. II (1842), p. 281.

† Collected papers on Iron and Steel (1840), p. 650.

There seems little doubt that it was from Indian crucible-steel that the celebrated Damascus sword-blades were made. Forged blades made from wootz have exhibited the same damascened structure which Faraday thought to be due to the presence of aluminium. The results of the chemical investigation of these specimens which is to be undertaken by Mr. H. C. Jenkins of the Royal College of Science, South Kensington, will be embodied in the final report.

The following is a brief description of the process as now practised in the Trichinopoly district :—The crucibles used are made of a ferruginous clay and charred rice-husk, well kneaded together and turned out by the hand to a shape something like a large pear, about 6 inches in length and 3 inches in diameter at the widest part. They are charged with pieces of wrought iron, together with 4 or 5 per cent. of its weight of wood of the *Avaram* tree (*Cassia auriculata*)* and with leaves (about 1 per cent. by weight) of *Calotropis gigantea*,† when the mouth is sealed with clay, which is tightly squeezed down upon the leaves. Twenty-five such crucibles when dry are placed with their pointed ends downwards in the furnace, forming a flat arch and extending across a circular, saucer-shaped pit which opens downwards by a hole, 9 inches in diameter, to a bottle-shaped cavity, 3 feet 6 inches deep and about 1 foot 6 inches in diameter. Before the crucibles are arranged in their places, this pit is packed to the neck with straw and serves afterwards as a receptacle for the slag, which melts off the crucibles during the blast and trickles down into the straw.‡ A short distance above the contracted neck at the top of this pit a clay tuyere conveying the blast from two goat-skin bellows opens into the saucer-shaped depression below the arch of crucibles. The crucibles are, from time to time during the blast, shifted to allow the charcoal, which is fed from above, to fall through and feed the fire below. The men who work the bellows are protected from the sparks by a thick mud wall, through which the tuyeres pass. This wall forms the support at one end of a low bamboo and palm-leaf hut, which extends about 2 or 3 feet behind the blowers.

After about two hours continuous blast the twelve central crucibles, having been subjected to a greater heat than those around the sides, are removed, the iron generally being by that time well fused and carburised. It is easy to ascertain, by shaking with a pair of tongs, whether the contents are in a fluid condition or not; and when a crucible is removed the worker first gives it a sharp tap on the ground to bring the molten contents to the bottom, when he places it in a bed of dry sand, apex downwards, to cool. The crucibles removed are replaced by an equal number of fresh ones, which have previously been raised to a high temperature by placing on the surface of the arch during the blast, and this substitution process can be carried on indefinitely.||

* *Avaram*, Tamil; *thangedu*, Telugu; *tarwar*, Hindustani; *avarike*, Kanarese.

† *Brakam*, Tamil; *yekka*, Kanarese; *madar*, *safed-ak*, Hindustani. It is perhaps not improbable that the use of this plant as a medicine and the wonderful powers ascribed to it in religious and domestic ceremonies may account for its employment as a "medicine" in renovating, as they say, old iron. It is true, however, that when leaves of this plant are not procurable, other kinds may be used, such as those of the *weepale*, a plant also used medicinally. Heath and others say that leaves of *Leitsonia elliptica* (*Convolvulus laurifolius*, Roxb) are also used as an alternative, but I was unable to confirm this point. It is of little importance in any case, as the wootz-makers told me they do not now place much importance on the kind of leaves employed.

‡ As this deep slag- or ash-pit does not seem to have been mentioned by Buchanan, Heyne or Heath, it is, perhaps, peculiar to the Trichinopoly *karumans*.

|| It will be noticed that this and one or two other details are not given in previous accounts (by Heath and others); but I am describing the process only as I saw it in the Trichinopoly district. The principle is, however, precisely the same as that described by previous writers.

The ingot in cooling retains the shape of the bottom of the crucible. It is thus more or less of a stout conical form, and the upper and flatter side is always beautifully marked with radiating striæ. In the Trichinopoly district two sizes are made, the heavier weighing about 11 ounces and the smaller about 8 ounces.

2.—*Salem Steel*.—Flat, approximately circular, cakes of steel are made in the Salem district from highly carburised iron by a rude process resembling in principle that of the Styrian open hearth finery and the ordinary puddling of pig-iron (see plate). The following is the process as now carried on:—

In the manufacture of wrought iron, certain easily fusible beads of iron are produced and melted off as shot. These are in reality highly carburised particles, or cast iron, and it is from these that the steel is made. The shot are first pounded in a stone-mortar with a wooden pole, guarded with an iron ring—the *olakai* used for pounding rice. By this process the small particles of slag adhering to the shot are removed, and the cast iron receives an imperfect polish. The powdered slag material is separated by sifting in the ordinary manner in a *moram*, or shallow basket.

A hole is dug in the ground about one foot deep and about one foot in diameter. At one side a semi-circular groove is excavated from the surface to the bottom of the pit. A large cake of soft clay serves to divide this small excavation from the other part of the pit and the smaller chamber serves as the finery in which the steel is made. The bottom of this is first covered with a layer of dirty quartz obtained from sifting the crushed ore, as described in the process of dressing the magnetite for the furnace. There are generally pieces of magnetite adhering to this quartz—a fact that accounts for the “orey particles” in the cakes of steel produced which so puzzled Mushet to explain, and from which he concluded that the steel must have been produced direct from the ore. On this hearth of quartz an ignited coal is placed and the small chamber filled with charcoal. A tuyere, previously built in with the clay partition, points downwards at an angle of about 45° and receives the nozzles of two goat-skin bellows, by which a continuous blast is maintained. The shot are first wetted and thrown upon the charcoal. The amount of shot used is governed by pure guess-work, as in the wrought-iron smelting. The blast is continued for about half an hour, when the process of decarburisation is complete, and the tuyere and clay-partition broken down for the removal of the steel-cake, which is first slightly cooled by a dash of water, and then hammered to remove the casing of slag which has formed around it. The workers are quite aware of the fact that, if they continued the process too long, the resulting product would be of no more use than ordinary wrought iron, although, of course, they do not know that the removal of the carbon, which gives the steely properties to iron, is the result of continued oxidation. The cakes of steel thus made are sold for 4 or 5 annas each in the bazaar.

V.—INTRODUCTION OF EUROPEAN PROCESSES.

In giving a short account of the attempts which have been made in the past to smelt iron and steel on a large scale in India, I shall only deal with the manufactories which have been opened within the limits of the area whose natural resources in iron have been described in the preceding pages.

Since the first attempt to smelt iron on a large scale at Porto Novo, South Arcot, in 1880, works have been opened at Beypore in the Malabar district, at Pulampatti in the Salem district, and at Trinomalai in South Arcot. The Napier Foundry Company, established in Madras in 1875, seems never to have opened works for the smelting of iron. These works

although successful as regards the quality of iron turned out, were, without exception, decided commercial failures.

There are many reasons for supposing that this signal failure was not due to any fault in the product. A portion of the pig-iron made at the Porto Novo works was sent to England for conversion into steel, and Mr W. Sowerby states that a large quantity was used in the construction of the Britannia tubular bridge and the Menai bridge. Steel made from Indian pig-iron seems also to have commanded favourable attention at Sheffield for the production of files and for other purposes.

As to the cause of the commercial failure of this enterprise, various reasons have been given. Mr. Sowerby criticised the working plant, the intermittent and irregular supply of pig to the market, and the hot climate, in which the workmen brought from Styria would not work; whilst the Native workmen were stated to be of little use.* Sir D. Brandis thought the diminishing supply of fuel, which was a decided drawback at each place (except, perhaps, at Pulampatti), might have been due to injudicious management of the forests. It is not improbable that all these unfavourable conditions contributed their share to this signal failure. Mr. Sowerby considered Mr. Heath to be more sanguine than practical; and, although it may be easy enough now to see the errors that were committed, it should be remembered that, in opening works on a large scale in South India, the conditions of labour, fuel, market, and climate are all so widely different from those in England that it is not surprising to find the earliest attempts in this direction unsuccessful.

With regard to the fuel question Sir D. Brandis says, "Had Mr. Heath and the Company which succeeded him, instead of relying upon the supply of charcoal brought from vast areas of jungle, concentrated their efforts in this respect, had they obtained from Government the grant of sufficient areas of jungle in the vicinity of the works, and had they placed these areas under efficient protection and improved them by planting in suitable places, these areas might by this time have been converted into dense forest, and their produce might have secured the success of the business. I say this might, but do not maintain that it would, have been achieved; for such proceedings would have required professional skill and knowledge, continued outlay of money, with very little return, during a long series of years, and, most of all, great patience and steady perseverance in one line of action."†

The works at Pulampatti were supplied with charcoal from Sholapadi, 18 miles up the Cauvery, where the charcoal was made in large closed furnaces and carried to Pulampatti in boats. It was delivered at the works at a cost of Rs 6 per ton; but the supply was irregular on account of the charcoal-burners, who would not work continuously, and were unable to carry on the occupation owing to the unhealthy state of the jungle at certain times of the year. The ore for these works was obtained from the rich beds of Kanjamalai, and yielded, according to Mr. Maylor, the Manager, 55 per cent. of iron at an expense of 3½ tons of charcoal per ton of iron produced.

In 1859 the charcoal for the Porto Novo works had to be brought from a distance of 25 miles, whilst for the Beypore works it is stated to have been actually brought from Ceylon. Whatever other disadvantages there were in the circumstances attending the introduction of European iron-works into India, and whatever may have been the faults in their management, there

* Mr. T. Middleton, Agent and General Manager of the Bengal Iron and Steel Company, tells me that he has no reason to complain of the Santhalis and Bengalis whom he has trained on the works at Barrakar.

† Suggestions regarding the Forest Administration in the Madras Presidency, 1883, page 36.

24 *Iron-resources and industries, South Madras Presidency.*

is no doubt that the limited, and somewhat irregular, supply of fuel contributed very largely to their failure as commercial enterprises, just as to-day the Native smelting industry is at a very low ebb almost solely from the same cause.

It may be interesting to place on record a short history of the establishment and downfall of the companies which have attempted the introduction of iron-smelting on a large scale in the Presidency of Madras.

The idea of manufacturing bar-iron by European processes from the rich ores of South India was due to Mr. J. M. Heath of the Madras Civil Service. After resigning the service Mr. Heath obtained from the Court of Directors of the East India Company the exclusive privilege of manufacturing iron on a large scale in the Madras Presidency. In 1830 trial works were erected in the South Arcot district at Porto Novo and maintained by subsequent advances from Government. On the expiration of these special concessions, he obtained free leases in different districts for the raising of ore and the cutting of fuel, on which there was charged, after five years, a small annual rental. The business was taken over in 1833 by a company, the Porto Novo Steel and Iron Company, and by them the works at Porto Novo were enlarged, and similar works afterwards established at Beypore. The undertaking, however, notwithstanding new concessions, did not pay, and in 1849 there remained a claim by the Court of Directors against Mr. Heath of Rs. 22,240. In 1853 a new association, the East India Iron Company, was started with a capital of £400,000. They obtained the exclusive right for thirty years at an annual rental of £500 to raise ore on Government waste lands in South Arcot, Salem, Malabar, Canara and Coimbatore, and paid the Government £10,000 in settlement of the debts of their predecessors. This company erected one blast furnace, worked with cold blast, at Trinomalai in South Arcot, and another, worked with hot blast, at Pulampatti on the Cauvery river, about 12 miles above Erode. The works here were stopped in 1858, whilst at Porto Novo operations ceased in December, 1866, at Beypore in 1867 and at Trinomalai in the same year. The deeds by which this company surrendered the privileges granted by Government were settled in August, 1874, the company paying £8,000 on account of the lands owned by them near Calicut and for compensation on other losses.

In 1875 another association, under the name of the Napier Foundry Company, was established in Madras with the intention of smelting pig-iron, besides the ordinary foundry-work carried on at the Napier Foundry which they purchased. In November, 1876, the Government granted, on payment of small seignorage, the right of making charcoal over 42 square miles of land in North Arcot. The land was divided into fifteen blocks, one only being cut at a time to encourage reproduction in the other portions under supervision of the Forest Department. In July, 1877, the Company received, on their own application, permission to cancel the agreement, and thus ended the last attempt to manufacture iron by European processes in the Presidency of Madras.

RESIN AND TURPENTINE

FROM

INDIAN PINES.

In this hand-book the available information as to the extent of pine forests available and manufacture of turpentine on the North-Western Himālaya and in Assam and Burma has been brought together in amplification of a summary of the main facts elicited by enquiries as to the likelihood or possibility of establishing a trade in turpentine between India and England, which was sent to the Secretary of State in 1885.

The chief countries in which resin is obtained, and in which facilities exist for the production of colophony and turpentine, are France and America.

I.—FRANCE.

The manufacture of resinous products from the maritime pine (*P. pinaster*) is carried out on an enormous scale in the departments of the Gironde and Landes. The processes of collecting the resin and manufacture of the products are fully described by M. Croizette Desnoyers in his "Notice sur le gemmage du Pin maritime"* from which the following account is taken:—

I.—COLLECTION OF THE RESIN.

The maritime pine contains very large and abundant resiniferous canals. But, as the resinous juices are much more active in the sap-wood than in the heart-wood, light vertical incisions will expose these canals, and produce a flow of resin. On this principle the extraction of the resinous matter depends.

Towards the end of February or at the beginning of March the operation is started by removing the rough outer bark, so that only the last few layers of bark tissue are left outside the sap-wood. The bark should only be removed over that portion of the trunk which will be resined during the season. An allowance is made of 10 centimetres for the height and 2 to 3 centimetres for the width, this operation having

* Exposition Universelle, Paris, 1878. Ministère de l'agriculture et du commerce, Administration des Forêts.

France.

the following objects: (1) to prevent the débris of the bark from falling into the receiving vessel; (2) to avoid blunting the edge of the cutting instrument and losing resinous matter by the roughness of the bark.

The second operation, which is generally performed from the 1st to the 10th of March, consists in cutting the sap-wood, and consequently the resiniferous canals, with the axe (*abchoite*). The resin tapper commences by making at the foot of the pine an incision, called the cut,* which is convex above, and has a width of 10 centimetres, a height of 3 centimetres, and a depth of 1 centimetre.

The resin oozes out in viscid and transparent droplets, which become inspissated in contact with the air. A portion, called *galipot*,† solidifies, and forms a crust on the cut, and the remainder, which is more liquid, flows into a pot.

Every week, and in the season during which the pines yield abundantly every five days, the cut is refreshed by *piquage*, i.e. the removal of a thin shaving at its upper part, so that it continually increases in height while maintaining a constant or even decreasing length.

In making the *piquage* the resin tapper revives the wound over a length of 10 to 12 centimetres, but takes care—and in this his skill is tested—to remove at each *piquage* only an extremely thin pellicle, so that the wound may be refreshed as frequently as possible without exceeding the depth of 1 centimetre. The *piquage* takes place about 40 to 45 times in the year.

When the pot is sufficiently filled, which occurs every fifteen to twenty days, the resin tapper empties it into a wooden basket, replaces the pot, and transports the contents to big reservoirs called *barcous*, which are made of wood or bricks here and there in the forest.

There are two methods of tapping: tapping to death (*gemmage à mort*) and cautious tapping (*gemmage à vie*).

The former is applied both to pines which have to disappear in the thinnings and to those which have reached the term of exploitation or turn for regeneration. Under these conditions, as the pines have only a short time to live, as much resin as possible is extracted, and several cuts—two to six according to the size of the tree—are made simultaneously.

The latter is only practised on trees which it is desired to preserve for a long time. It is necessary, therefore, to tap them in such a way as not to exhaust them and completely arrest their vegetation. With this in view, only one cut at a time is opened. When the first cut, at the end of five years, has reached the height of 3m. 80, the tree is allowed to rest during several seasons, and, only after this period, a new incision is made, either from 15 to 20 centimetres from the abandoned cut, or on the opposite side of the pine. The operations are carried out in the same manner as in the first instance. In this way a circuit of the tree is made, and the intervals between the old notches are tapped in rotation; and, with these consecutive periods of tapping and rest, not only are the pines resined, but are also kept alive for a long time.

[As regards the methods of tapping and management of the pine in the Dunes of Gascony, Colonel Bailey ‡ makes, *inter alia*, the following observations:—

Gemmage à mort is adopted in all thinnings of trees aged 25 years

* The cuts, when left alone, soon heal up by the formation of new rings of wood and bark, and some time after a new cut may be opened in the swelling formed by the bark over the old cut.

† This is scraped off once or twice a year.

‡ *Indian Forester*, February, 1888.

and upwards, and also in the seed felling, as well as in the final felling. The operation is commenced five years before the trees are to be cut down, and is continued for four years. The aim is to take all the resin that the tree can give, leaving it exhausted at the end of the fourth year. One result of this treatment is to cause an abundant growth of seed; and this fact has great importance when the last representatives of the crop are about to be removed, for it ensures the springing up of a full crop of seedlings.

Gemmage à vie.—The trees are not tapped until they have a girth of from 44 to 48 inches, which is usually attained when they are from 30 to 40 years old.

Management of the pines.—The pine has long thin needles giving very light shade, and the trees will not stand being grown close together. Those only which are sufficiently far apart, vigorous, and have a well-developed crown, yield resin in large quantities. Thinnings are commenced when the young trees are from 6 to 8 years old, and are repeated every five or six years. When the forest is 20 years of age, there should be from 250 to 280 stems per acre; but at 30 years not more than 100 to 120 of these should remain, the number being finally reduced to from 60 to 80 when, at the age of 70 or 80 years, regeneration fellings are commenced. With this number on the ground, the upper or cone-bearing branches are free, but not the lower ones. These latter should be allowed to touch, so that the natural pruning of the lowest of them may be effected. In order that the extraction of resin may be successfully carried on, it is necessary that the trees should have clean stems, free of dead branches, up to a height of some 16 feet; and to ensure this it is usual, as an additional precaution, to prune away the lower branches at the time that the first thinnings are made, that is, when the forest is not more than from 6 to 8 years old; but this has to be done carefully, avoiding the removal of too many leaves at a time, as otherwise the growth of the young trees would be checked. It is considered that the introduction of oak (*Q. pedunculata*) beneath the pine would be of great value as a protection to the soil, and as a means of keeping down the undergrowth of grass, gorse, brooms, etc., thus diminishing the risk from fires.

The resin is collected either in a hole scooped out in the sand, or in a glazed earthenware pot.* The first of these systems is very primitive, and possesses inconveniences which do not exist in the other, which is known as the *système Hugues*. The pot is placed beneath the notch from which the resin issues. Each year the resin tapper raises the pot, so that it is at the upper end of the cut worked during the preceding season. It is kept in its place by a nail beneath it, and, when a new cut is worked, the pot is placed on the ground at the foot of the tree.]

2.—MANUFACTURE OF RESINOUS PRODUCTS.

The resin, as it is placed in the boiler, is made up of a mixture of an essential oil, turpentine, and foreign substances, solid or liquid, resulting from

* To diminish waste, the pot may be covered with a board, which prevents loss of the volatile part of the resin. To get the resin to flow into the pots, a small curved plate of zinc is tightly driven in an oblique direction into the wood immediately over each pot; or a flat plate of zinc with one corner slightly curved upwards is driven in obliquely across the cut, the curved corner being immediately over the pot, which is hung on one side of the cut. When there are irregularities in the stem, or when it does not stand perpendicularly, chips of wood, driven into the wood and ingeniously arranged, guide the resin in the required direction.

prolonged stay in the pots or reservoirs in the forest. Like all essential oils, turpentine is a mixture of an essence called essence of turpentine and a resin called colophany.

Essence of turpentine has a density of 0.85. It is a colourless, sticky liquid, with a characteristic odour, boiling at 157° , and volatilising easily in contact with hot water and steam at 100° . The density of the vapour of the essence is 4.7.

Colophany is a solid amorphous body, of a more or less deep honey-yellow colour, which has a density of 1.08, softens at 70° , melts at 135° , and boils at 200° .

The double principle on which the extraction of the turpentine or its derivatives rests is that :—

1. By liquefaction and filtration of the resin, the turpentine is separated from the water, gas, earth, and wood which are accidentally mixed with it.
2. By distillation of the turpentine, which is an intimate mixture of a solid and liquid with very different boiling points, the essence of turpentine and colophany can be separately collected.

The resin is placed in a boiler, closed by a movable lid, which is heated at the same time by an open fire and by steam circulating in the pipes A, A', A'', A''' [Fig. 1]. After five or six hours the temperature reaches 90°C and the

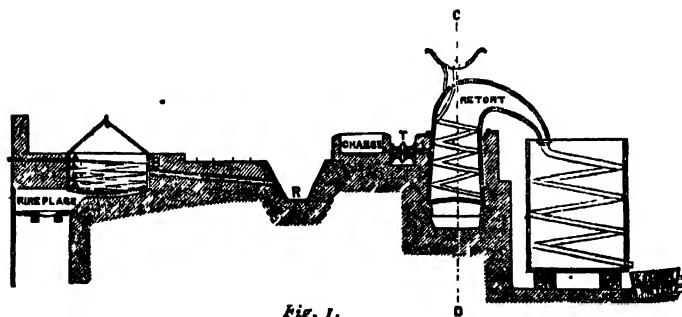


Fig. 1.

liquefaction is complete. At B there is an aperture provided with a grating and everything which is above this kind of filter flows into the receptacle R. There only remains in the boiler a small quantity of turpentine mixed with foreign substances.

The turpentine is next transported from the receptacle R into a reservoir called the *charge* which measures exactly the quantity which should be introduced, at each operation, by the pipe T into the still.

Pipes pierced by small holes permit the introduction of steam into the retort when the turpentine is at a temperature of 135°C . Effervescence is then produced, and the essence is completely set free. The average charge of the retort is about 300 litres.

At E (Fig. 2) there is an aperture closed by a wooden stopper, which is carefully cemented. When the essence no longer passes into the worm

the operation is stopped. The colophany flows through the pipe E into a receptacle, and is put into a half cylinder made of very fine metal

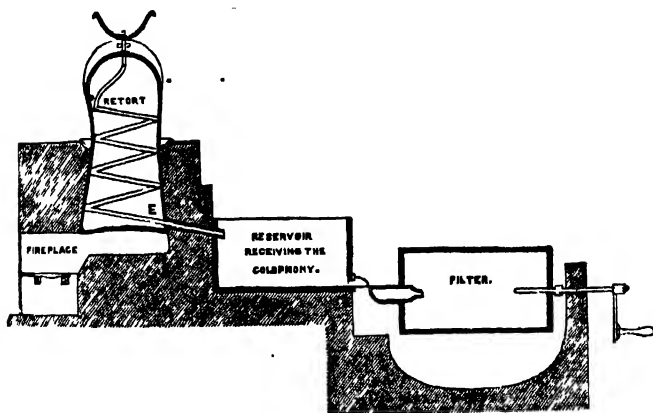


Fig. 2.

gauze which is agitated round its axis. The colophany falls into a reservoir placed beneath the gauze, which retains only the unimportant residue.

The colophany comes out of the retort with a maximum temperature of 130°C , and contains a very fine dust, which mars its transparency, and it has to be filtered through the metallic gauze. It is then put into casks, and may be at once despatched.

The essence which comes out of the condenser, being turbid, is put into earthen jars containing each about 300 litres. The covers are cemented with clay, and the jars allowed to stand for four or five days. The impurities in the essence are deposited at the bottom of the jars. Sometimes copper reservoirs are used, in which the essence can be kept for a longer time, as there is less evaporation.

The quality of the resin varies with the season of its collection, the age of the pines and their vegetation. Further, according as the season advances, the resin is less rich in essence, and, consequently, increases in weight, distillation is more difficult, and greater heat must be applied.

The process of manufacture of resin, as carried out in a factory which he visited when travelling from Bordeaux to Arcachon is thus described by Colonel Bailey :—The crude resin, brought to the factory in casks, is, notwithstanding the precautions taken, found to be mixed with a certain quantity of foreign substances, such as earth, chips, bark, leaves, insects, etc. After adding about 20 per cent. of solidified resin (*barras*) scraped from the cuts, it is heated moderately in an open caldron so as to bring it into a liquid state, when the heavier impurities sink to the bottom, and the lighter ones rise to the surface. The liquefied resin, thus obtained, consists of two distinct substances, *vis.* colophany, which is solid at the ordinary temperature of the air, and spirit of turpentine, which is liquid and volatile, and some of which is lost if the caldron is over-heated. These two sub-

stances are separated by distillation in the following manner:—The liquid resin is allowed to run through a strainer into a retort, a small quantity of water being introduced at the same time. The rising steam carries the spirit of turpentine with it, and both are, after passing through a refrigerator, caught in a liquid form, in a trough placed to receive them. The spirit, being lighter than the water, lies over it and is easily drawn off. The colophany is then allowed to run out of the retort, and, passing through a sieve, is caught in a vat below. Thence it is poured into flat metal dishes and allowed to harden in the sun, under which process the finer qualities acquire a delicate amber colour. The impure resin left in the caldron is distilled separately, and yields resin and pitch. The spirit of turpentine sells for 24s. per 100lb, and the colophany for 9s. per 100lb, but the purer kinds, for the manufacture of which only the most liquid portions of the raw resin are put into the caldron, fetch from 13s. 6d. to 14s. 6d., the price of the finest quality, known as Venice turpentine, rising to £4.10s. per 100lb.]

3.—USES OF THE RESINOUS PRODUCTS.

Essence of turpentine enters into the manufacture of oil paints, varnishes, different kinds of coating and caoutchouc.

Colophany and dry crude resin are used for sizing paper, for obtaining the oils with which vegetable fats and printing ink are made, and for coating the interior of beer barrels. They also enter into the composition of some varnishes and sealing waxes, and are used for bending leaden pipes. Acid colophanies form, with caustic alkalis or alkaline carbonates, salts which possess properties analogous to soaps. These resinous soaps behave exactly like those which proceed from fatty bodies; and, as they absorb atmospheric moisture very readily, they are generally mixed, in varying proportions, with ordinary soaps. The resin, by replacing a portion of the fatty acids, appreciably diminishes the cost.

Galipot enters into the composition of varnishes, and is employed in the dockyards for painting the masts and sides of ships.

The refuse of manufacture of the various products can be burnt in closed chambers to produce lampblack.

4.—UTILISATION OF THE WOOD OF TREES WHICH HAVE BEEN TAPPED.

In the *Indian Forester*, February, 1888, attention is drawn to the mistaken belief that trees grown for timber cannot be tapped, and Colonel Bailey says:—"The effect of tapping the pine is to cause a flow of resin towards the lower portion of the stem, which thus becomes charged with that substance, and is rendered harder and more durable than the upper portion of the tree. The resinous wood is used for various purposes: very largely for railway sleepers when it is injected with creosote or sulphate of copper. Planks and scantlings are sent for sale to Paris; while poles, extracted during thinnings, are used as telegraph posts and mine-props. Charcoal is also made in some forests."

II.—UNITED STATES.

The chief supply of turpentine in the United States is now almost wholly derived from the long-leaved or yellow pine (*P. australis*) of the Southern States.

The method of obtaining the turpentine is described by Mr. F. B. Hough* in the following words:—

"In winter the trees are 'boxed' by cutting a hole in the side, about 3 inches wide, 6 inches deep, and 12 inches long, near the foot of the tree, forming a cavity that will hold about 3 pints. The turpentine begins to flow early in the spring, and continues till towards the end of summer. The incisions are enlarged and extended higher up about once in a week or ten days, and sometimes two or three 'boxes' are cut in the same tree. The crude turpentine is dipped† out of the 'boxes,' and scraped off from the trees from time to time, and now the greater part is distilled near the forests, and the refined products sent from thence to the markets.

"In North Carolina the turpentine is collected about once a month, and 10,000 trees will, in a good season, yield 50 barrels of spirits of turpentine and 200 barrels of rosin. In other regions the trees are cut from twenty to thirty times in a season, and yield from eight to ten dippings. A man will 'chip' from 10,000 to 12,000 boxes in a week as a task. From 1,000 boxes they dip from three to five barrels of 280 pounds each.

"The yield per box in soft turpentine is from ten to twelve pounds, or twenty to twenty-five to the tree of usual size. A barrel of turpentine will yield five gallons of spirits of turpentine, and from sixty-two to sixty-five per cent of its bulk in rosin. The product of the first year yields a fine light resin, and it grows darker from year to year. A still of forty barrels capacity will distil the crude product of about 350,000 boxes.

"Turpentine is produced to advantage only in warm climates, and in a given place to better advantage in hot and humid seasons than in those that are cold and dry.

"Trees exposed to the air and the sun yield better than those that are crowded and shaded, and those with a well-developed top and well set with branches much better than those with thin and light foliage."

III.—INDIA.

The question of creating a demand in England for Indian resins and turpentines, the manufacture of which is still in its infancy and requires development, has been before the Government of India since 1881.

In 1885 the following summary of the main facts elicited by enquiries in the North-West Provinces, Panjáb, British Burma, and Assam, as to the likelihood or possibility of establishing a trade in turpentine between India and England, was sent to the Secretary of State:—

1. *Cedrus Deodara* is far too valuable on account of its timber to permit of its being tapped for resin; besides, it only grows in the higher hills, and is thus too far removed from the market. Similarly the high cost of transport from distant forests places both *Abies Webbiana* and *A. Smithiana* out of consideration. The only conifers, therefore, that need be taken into account in connection with the extraction of turpentine for sale are the pines of Assam and Burma, *P. Khasya*, and *P. Merkusii*, and those of the North-Western Himálaya, *P. excelsa* and *P. longifolia*.

* Elements of Forestry, Cincinnati, 1882.

† Oil of turpentine is distilled from the liquid crude turpentine collected in boxes or artificial cavities cut in the trunk of the tree. This liquid substance is technically called *dip*.

2. The area of forests containing trees of *Pinus Khasya* is estimated to be—

		Sq. miles.
Assam		
British Burma	{ Tenasserim Circle	230
	{ Pegu Circle	40
		4
	TOTAL	274

Of the area in Assam, only 33 square miles are at the disposal of Government, the remainder being the property of private persons and subject to 'jhum' cultivation. The forests contain mostly young trees, from which only a very small yield, if any, can be expected at present. The area in British Burma could, with careful fire protection, be largely extended, and the hill-sides transformed into pine forests; but the existing forests are situated at an elevation of from 4,000 to 7,000 feet. They are, moreover, far removed from the market and are inaccessible, so that their management would be expensive. From experiments made it has been ascertained that the cost of crude turpentine obtained from *P. Khasya* amounts to Rs 6 per 100 lb delivered in Moulmein, and Rs 32 for the same quantity brought from the Khasi hills in Assam to Calcutta. The supply at present is very limited, but it could, no doubt, be increased by careful conservative management of the forests.

3. The forests of *P. Merkusii* extend over an area of about 50 square miles in the Thoungyin valley of the Tenasserim Circle. They have been much cut up by taungya cultivation, but successful fire protection would suffice to re-stock the areas, and the forests could be extended without difficulty by propagating the tree. Experiments have shown that the resin can be extracted without killing the tree, and that a tree of 6 feet girth can yield 12 lb at the first tapping. The quantity will decrease in the second and third years, after which the tree will require a lengthy period of rest. The cost of delivery of 100 lb of crude turpentine at Moulmein amounts to Rs 12. The quantity at present available is small, though it could be largely increased.

4. The areas covered with forests of *P. longifolia* lie in the North-West Provinces and the Panjáb, and are much more extensive than those of the other pines already mentioned, aggregating from 3,000 to 4,000 square miles, including those in Kashmir and other Native States. Most of the forests are very open and exposed to annual conflagrations, but they would rapidly improve with the adoption of a system of fire protection, which is absolutely necessary if they are to be worked for turpentine. Trees measuring between 4 and 6 feet in girth yield from 5 to 6 lb at the first tapping, and, unless greatly overtapped, do not die from the process. The yield rapidly decreases however, and only about 10 or 12 lb per tree can with safety be obtained every four or five years.

5. It will be observed that, in every case, strict fire protection on a large scale is indispensable to the success of the operations, and this can only be undertaken at present if the extraction of turpentine promises to be a success financially, a contingency which seems very doubtful, as it will hardly be possible to deliver the crude material at any railway station in India under an average cost of from Rs 8 to Rs 10 per 100 lb. The question whether experiments should be continued in the hope of establishing a trade in turpentine between India and England depends entirely on the price which it is likely to fetch in the English market.

1.—*Pinus longifolia* (Chir) and *excelsa* (Kail).

In 1898 a letter was sent by the Government of India to the North-West Provinces on the subject of the necessity for securing a market in Europe for the large quantity of resins and turpentines that Indian pines can yield, but

which remains unutilised. It was considered expedient to lose no opportunity of devising cheap, rapid, and effective methods of tapping and distillation and of the preparation of the numerous secondary products of distillation, and also of studying the conditions under which the trees give their largest yield. The Conservator of Forests, School Circle, was requested to set on foot experiments in connection with *Pinus longifolia* and *excelsa*, and among other points to determine the following :—

- (1) The cheapest, quickest, and most effective method of extracting the resin from each kind of tree.
- (2) The season of the year at which the work should be done.
- (3) The minimum age at which trees should begin to be tapped, when it is not intended to tap them to death (*gemmage à mort*).
- (4) The number of years in which tapping to death kills a tree.
- (5) The number of years during which a tree, which it is not intended to kill (*gemmage à vie*) can be continuously tapped; also the interval of years after which it may be tapped again, if the operation had to be discontinued in order to give it rest.
- (6) The effect of tapping on the timber of the trees.
- (7) The most favourable conditions as respects soil, aspect, elevation, gradient, climate, and closeness of leaf canopy under which trees to be tapped should be grown.
- (8) Outturn of resin per tree of various sizes and per acre fully stocked.
- (9) Distillation of pure oil of turpentine.
- (10) Expulsion of all trace of oil from colophony of *Pinus longifolia*.
- (11) Preparation of the various secondary products of distillation.

According to the *Indian Forester* (February, 1888),* the aggregate area under *Pinus longifolia* is comprised in the outer Himalayan belt, varying from 20 to 40 miles in width, from Nepal to the North-West frontier. No very approximate figure can be given for the total area lying inside British territory, but it certainly exceeds 2,000 square miles, distributed as follows :—

	Sq. miles.
Kumaon and Garhwal (Sarda to Jumna)	1,000
Jaunsár (Jumna to Tons)	300
Panjáb	not less than 1,000

of which only about 500 are at present workable."

In his working-plan of the Chfir Forests Circle,* Jaunsár Division, North-West Provinces, Mr. N. Hearle says with reference to tapping for resin :—" As this is as yet only in an experimental stage and its commercial success is not yet assured, no regular system of working can be laid down here. It will not, however, be necessary, to confine our operations to the Chfir areas within 2 miles of the river, but all the Chfir forests can be worked for this purpose. Altogether there are probably about 90,000 trees over 2 feet in diameter, and about the same number of second class trees from 18 to 24 inches in diameter which could be tapped. The large mature branchy trees in the compartments which have been felled over could be tapped to death, especially as this will favour the production of seed. The others can be tapped so as not to kill them."

As regards the available quantity of *Pinus excelsa* it is stated in the *Indian Forester* (February, 1888), that about 200 square miles are supposed to exist between the Sarda and the Ganges, and very little between the Jumna and Ganges.

Two methods of tapping the trees for resin may be described, *viz.*, Native and European.

The rough system employed by the hill-men in Kumaon and Garhwal,

described in the *Indian Forester*, 1888, is to cut a sort of niche into the trunk about 3 feet from the ground. The bottom of the niche is hollowed out to receive the resin that trickles down its sides. The resin is collected as the niche fills, sometimes as often as every second or third day, but usually between the fourth and fifth days.

The niche has to be deepened and lengthened from time to time, so as to freshen the wound and keep up the outflow of resin; otherwise the old resin would harden on the sides, and form an impenetrable crust through which no resin could ooze out. The same niche is, as a rule, used for two years and sometimes even for three, when no fires occur in the meanwhile to burn and scorch the resin-incrusted sides. The hill-men seldom concern themselves about the life of the trees they tap, and generally work three niches simultaneously in one tree.

The crude resin obtained by natives of the Himálayas from *Pinus longifolia* is said* to be sold in the bazárs under the name of *birosa*, *gandha phirosa*, *dhup*, *berja*, *lisa*, *khalja*, etc.; and a small quantity of turpentine is said to be distilled therefrom for sale in the neighbouring towns.

Systematic tapping operations have been carried on since 1887 in the Chir and Kail forests in Jaunsár by the Forest Department. The following interesting notes on the operations were made by Mr. C. G. Rogers, Instructor at the Forest School, Dehra Dun, during the Jaunsár tour, 1891:—

“Mr. Moir, the Divisional Officer, told us the following history of the development of the resin works. In 1884, twenty Chir trees were tapped for resin. A nick was cut in the wood of the tree itself, as is done by the natives of Kumaon, and the resin allowed to accumulate in the nick. The dimensions



Fig. 3.

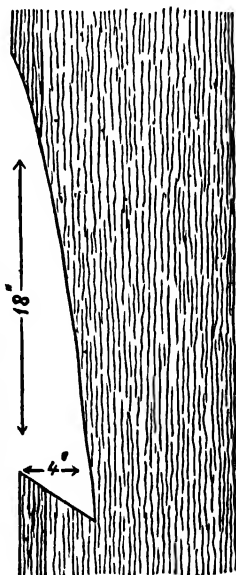


Fig. 4.

* *Indian Forester*, Vol. IX, 1883.

of the cut thus made are shown in Figs. 3 and 4. The trees were tapped from April to November, and the yield was as follows :—

10 trees (Dharmigād, yielded 30 seers.
" " (Chattragād) " 36 "

" Resin-tapping works were instituted on a larger scale in 1888. They were of an experimental nature, and, consequently, the cost of the operations was high and the yield of crude resin small.

" 1,024 Chir and 501 Kail trees were tapped in the Begúr, Malón, Nimis, and Kathyán blocks, the number of blazes being 2,873, or nearly two per tree. Incisions, 12" long and 6"-9" broad, were made, and the cuts renewed once a fortnight. By the end of November, 1888, they were 24"-30" long.

" Zinc, tin, and unglazed earthenware pots have been tried for catching the resin. The earthenware pots only cost 6 pice, and some of them have lasted three years. An objection to the unglazed pots is that they absorb a large quantity of water during the rains, and, consequently, deteriorate. The pots might, I think, be easily and cheaply glazed with *kanch*, as is done in the case of earthenware vessels made for the Military Department at the Merrut Jail.

" The blazes in the trees were made with the adze (Fig. 5) in common use

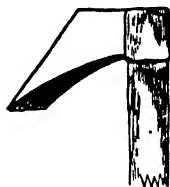


Fig. 5.

in the Jaunsár village. A set of tools sent out from France was tried, but their uses were not thoroughly understood, and, as they were found to be too heavy, they have not been brought into general working.

" The resin was first collected in a haphazard way, but it is now found that one man can look after 500 trees. His work consists of collecting the crude resin, refreshing the cuts when necessary, doing general repairs to the pots, etc. The resin is removed from the pots and packed in old kerosine oil tins. When the tins are full, their mouths are soldered, they are packed in wooden cases, and carried by mules or cattle to Chakráta and thence by cart to Dehra. A tin contains about 20 seers of resin on an average.

" The yield of resin in 1888 was 107 maunds, of which 98 maunds were sent to Dehra for manufacture. The yield between the 15th July and 30th August (when the rainfall is greatest) is very small, indeed in some cases practically nothing.* The cuts are not renewed during that time, and the resin is not collected. During the breaks in the rains, when the weather is warm and the sun strong, the resin flows most freely. The average yield per tree is 2 seers 14½ chattaks. Two cuts are usually made in each tree, but, in the case of large trees, as many as ten cuts have been made.

" The total cost of tapping, including cost of tools, pots and distilling apparatus was Rs. 1,764, of which Rs. 1,006 were expended on tools, pots, etc., and

* Experience both in Jaunsár and in the Panjáb has proved that, although the flow of resin is most active during the season of rest and when the weather is warm and dry, it still continues to ooze out in fair, and sometimes in considerable, abundance throughout the rest of the year. Pots left hanging in winter, under the snow, have been found to have overflowed with resin (*Indian Forester*, 1891).

R758 on collecting and producing 107 maunds of resin, which makes the cost of production a little under R8 per maund.

"In 1889, 1,973 Kail and 3,215 Chir trees were tapped, and yielded 2½ and 6 seers per tree, respectively. The outturn was 604 maunds of crude resin. The tapping has not yet affected the trees, and, if profitable, the same trees will be tapped for four successive years. The distillation was done at Deoband, and 312 maunds of crude resin were distilled yielding —

Colophany	:	:	:	:	:	:	:	200 maunds.
Turpentine	:	:	:	:	:	:	:	42 "
Loss of weight (water and dirt)	:	:	:	:	:	:	:	70 "

This gives per maund —

Colophany	:	:	:	:	:	:	:	26 seers.
Turpentine	:	:	:	:	:	:	:	5 "
Waste	:	:	:	:	:	:	:	9 "

"107 maunds of colophany were sold at R4-8 per maund, and 18½ maunds of turpentine at R16 per maund, yielding a profit of R0-14-9 per maund, excluding capital outlay, or annas 10 per maund net.

"In 1890 the work was continued. 473 Kail and 115 Chir had become exhausted and were abandoned.

"1,540 Kail and 3,100 Chir were again tapped, and the outturn was :—

Chir 286 maunds	:	:	:	:	:	:	:	or 3'69 seers per tree.
Kail 41 "	:	:	:	:	:	:	:	1'08 " "

"The tapping still had no effect on the vegetation of the trees tapped.

"A still was set up at Dehra in October 1890.

"Four tanks, two at Kathyán and two at Danichkhera, were made to store the crude resin in. At the former place the walls and bottom are of wood, and at Danichkhera the tanks are of masonry (stone set in lime) and have wooden covers. Before these tanks were used, the resin, when the supply of tins ran short, was stored in vessels made by hollowing out a piece of a stem of a Chir tree. These were furnished with wooden covers, but were not durable and were found to leak.

"The cost of the resin delivered at Chakráta in 1890 was R3-2-1 per maund, which was made up as follows :—

						<i>R a. p.</i>
Cost of collection	:	:	:	:	:	1 11 4 per maund.
" " tanks, soldering boxes, etc.	:	:	:	:	:	0 12 9 " "
" " carriage to Chakráta	:	:	:	:	:	0 10 0 " "

"The stock in the forest at the end of 1890-91 was 293 maunds, of which 220 maunds were afterwards sold at Kathyán at R4 per maund, and 20 maunds at R4-8 per maund.

"The cost of the collection of resin at Kathyán is—

						<i>R a. p.</i>
Collection	:	:	:	:	:	1 11 4 per maund.
Packing charges	:	:	:	:	:	0 12 9 " "
						<u>2 8 1</u>

"Offers of R4 and R4-4 per maund have been received for the crude resin without tins or boxes delivered at Kathyán.

"The following is a brief description of the resin works as they are carried on at present :—

"An incision about 1 foot long, 4 inches wide and, at the base, 2 inches deep (leaving out the thickness of the bark, which often reaches a thickness

of 2-3 inches) is made in the tree by means of an adze (*bassula*). A gouge chisel (Fig. 6) is then driven into the tree just at the bottom of the incision

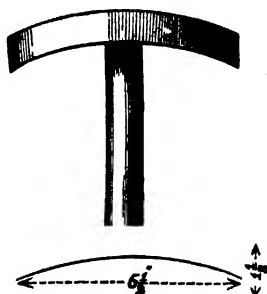


Fig. 6.

made by the adze, thus making a curved cut about 34 inches long into the tree. Into this a strip of zinc, 5 inches long and $1\frac{1}{2}$ inch wide, is driven by a wooden mallet, and forms a lip from which the resin flows into the pot placed below to receive it. The cuts are renewed,—i.e. lengthened and deepened—about twice a month in order to allow the crude resin to flow freely. The length of the cut at the end of the year's work is about 2 feet.

"The cuts on some of the trees which have been tapped for two or three years are only 2-3 feet long and 4 inches deep at the bottom. The incisions

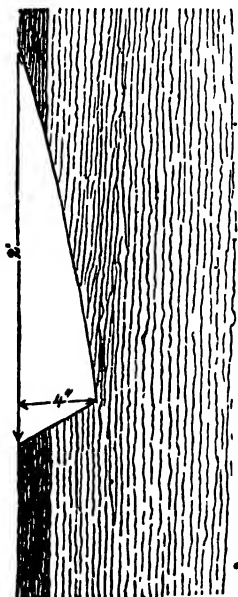


Fig. 7.

made in the trees which are being worked for the first time this year are about 4 inches wide and 1 foot long. The depth of the cuts at the end of the season is about 3-4 inches at the base, decreasing until the top of the incision is reached (Fig. 7).

"The thick bark of the Chfr pine is not cut away on either side of the incision, but is left close up to the edges of the blaze (Fig. 9).

"The pot hangs on a nail, and is further secured to the tree by a piece of string passed round it and fastened to a nail driven into the bark on either



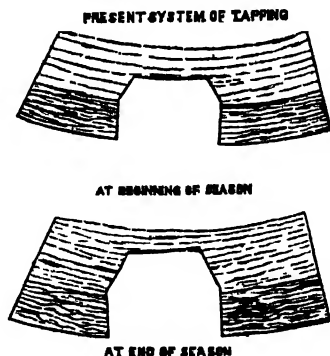
Fig. 8.

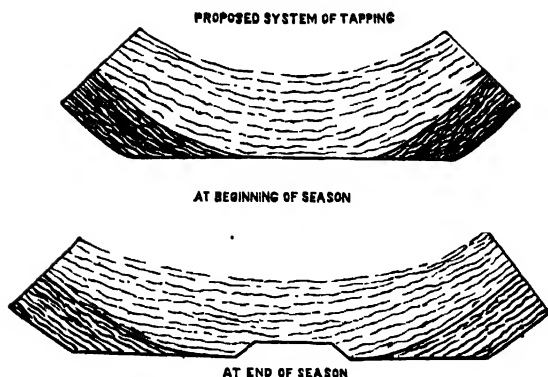
side of the pot (Fig. 8). The pot is covered with a piece of bark to prevent evaporation, and dirt from falling into it.

"We observed that only the outermost layers of the sap-wood, immediately beneath the bark, yielded any appreciable quantity of resin. This layer is at the most $\frac{1}{4}$ - $\frac{1}{2}$ inch in thickness. This thickness, I think, is more than was observed in the majority of cases, it often being as small as $\frac{1}{8}$ inch. This portion was cut through during the first 3 or 4 inches of the slanting cut, and the resinless layer reached. The resin formed on this portion, and then trickled down over the rest of the blaze into the pot below, being augmented by the resin which came from the same layer of tissues on the sides of the

cut. The exposed portion of the wood deeper than this produced no appreciable quantity of resin. I expect that an appreciable quantity of turpentine evaporates on the way down, and certainly some water must be given off, thus making the resin less fluid and, consequently, checking the flow of resin. In my opinion, as the cuts are at present made, it is only the top 3 or 4 inches and about $\frac{1}{2}$ inch at each side of the cut which yield any appreciable quantity of resin, and the rest of the cut, passing, as it does, through layers of wood in which the quantity of resin is very small, if not practically absent, is useless and harmful. In a freshly cut tree it was observed that the crude resin was flowing from the wood formed during the last four years. Inside the outer corky bark, between it and the wood proper, is a layer of white cortical tissue, the cells of which have not lost their water and food material. This layer soon becomes brown on exposure to the air owing to the formation of cork, and must not be confounded with the wood proper. It is the layer of wood for about $\frac{1}{2}$ inch inside this that gives the principal yield of resin. The effect of not removing the bark on either side of the incision, besides making it much more difficult to take a thin layer of wood off the cut (in freshening it), is that a good many bits of bark fall into the crude resin, collect in the pot, and materially add to the impurities. The crude resin which hardens on the cut is scraped off with an iron spoon, and mixed with the more liquid resin collected in the pot. The rough, scaly portions of the bark should, in my opinion, be removed before the incision is made, leaving the innermost thin brown layer, for a width of at least 4 inches greater than the maximum size the incision is likely to attain over the portions which it is intended to tap during the year. This should be done in February, a short time before the tapping season begins.

"This should cause a decrease in the amount of impurities in the crude resin, more especially the very minute particles of bark, etc., which it is found very hard to separate from the crude resin before it is introduced into the still, and which, becoming burnt in the process of distillation, probably materially darken the colour of the resulting colophany, *i.e.*, account for the darker colour of the Indian colophany as compared with the finer qualities produced in France. By removing the thick bark it will be easier to take off thin layers of wood when refreshing and lengthening the cuts, and the total depth of the cut at the end of the season would be very materially reduced—a most important consideration as far as the healing over of the wounds made in order to obtain resin is concerned. Figure 10 shows how I

*Fig. 9.*

*Fig. 10.*

propose that the cuts should be made. The total depth of the cuts at the end of the season should not, in my opinion, exceed $\frac{1}{4}$ of an inch. The height might be materially increased. The same incisions might be continued upwards each year, so as to bring a new set of resin ducts into bearing. The pot should be removed to the top of the last year's cut,* and a fresh cut made as before. This point does not seem to have been sufficiently considered so far. The tendency has been to deepen rather than to lengthen the cuts. The trees tapped are large ones, and there is no reason why the cuts should not be at the same time wider, so as to increase the area of the resin-producing areas."

The process of extraction of tar from Chir pine wood at Chattragadh is thus described by Mr. Rogers:—†

"The tar is separated by subjecting small pieces of Chir pine wood to slow complete combustion in a kiln, through which only a small supply of air is allowed to pass.

"The kiln is made of stones and mud-mortar, the interior being faced with lime, and is egg-shaped inside; its height and also its maximum diameter being 5 feet. It tapers towards the lower end, into which is fixed a perforated iron plate. At the upper end of the kiln is an opening 2 feet in diameter.

"The wood, cut into long strips 1 or 2 feet long and 4 or 6 inches round, is introduced at the upper end of the kiln. The pieces of wood are packed as tight as possible (the closer they are together the better). The upper opening is then closed with a dome of mud-mortar and stones, three holes being left to admit air. The wood is lit from the top, and burns downwards, the rate of burning being regulated by closing or opening the different holes.

* As pointed out by Colonel Bailey (*loc. cit.*), this has the great advantage that the resin is not mixed with any large amount of foreign substances, and that, as it runs down the length of a single year's cut only, the loss by evaporation is less than when it was collected at the foot of the tree. When the pot is too high to be reached from the ground, it may be reached with a ladder or removed by a sliding staff, furnished with a pair of metal arms to grasp the pot. And, if a broad-bladed hook-like tool is fixed to the staff, the cuts can be renewed by the workman while standing on the ground.

† Journal of the Hill Tar of the Imperial Forest School, April and May 1891.

"The charge of the kiln is about 15 maunds, and it takes nine days to burn, the volatile products being driven off and charcoal remaining in the kiln.

"Crude tar, organic acids, and water pass through the perforated plate at the bottom, and are collected in tins. Good pitch has been made by driving off the water and organic acids from the crude tar.

"From 15 maunds of wood thus subjected we get 6 maunds of charcoal and 1½ maund of crude tar.

"Two new kilns have been recently constructed at Khunigod and Darmigod, and about 80 maunds of tar have been extracted from Chlr wood (*P. longifolia*) during the winter. A portion of this has been manufactured into pitch. The cost of manufacture has now been considerably reduced, and at Darmigod has amounted to Rs 2-8 per maund against Rs 3-12 per maund last year at Chakrata. The actual cost of tar delivered at the Chakrata chowky will, therefore, not now exceed Rs 3-8 per maund. The price of coal tar at Chakrata is Rs 10 per maund.

"The tar is at present used for departmental uses, such as for tarring bridges, railings, roofs, etc., for which purposes it is mixed with one third coal tar, as it is not sufficiently adhesive if used alone, and soon washes. If used in this way, it adheres nearly as long as pure coal tar, with the great advantage that the cost is reduced by about one-half."

The following note on the resin-tapping industry is taken from the Administration Report of the Forest Department, North-West Provinces, 1890-91:—

"This industry promises to become one of great importance in the hills, as numerous enquiries both for crude resin and for the manufactured Colophony or resin are being sent. We are offered as much as Rs 4 to Rs 4-4 per maund of crude stuff in Chakrata, and steps have consequently been taken to tap a much greater number of trees in 1891, and improve the style of cut so as to ensure a better flow and less waste. It has already been recorded that 219 maunds of crude resin were worked up at the Forest School in Dehra and converted into 170 maunds of resin and 390 gallons of oil of turpentine. The resin was all sold to the North-West Soap Company at Meerut at Rs 5-8 per maund; but so far the turpentine has not sold well, although those who have tried it, and among them the Deputy Superintendent of the Great Trigonometrical Survey at Dehra, have pronounced favourably on its quality. The Conservator has not the slightest doubt of it eventually finding a very good market. All it wants is to be known, and he will be glad of any assistance the Government can give in bringing it to the notice of Railway and Public Works Department Engineers and other likely customers. What has been sold has been sold at a nominal rate of Rs 2-8 per gallon. The value of the resin and turpentine produced amounted to Rs 1,740, and against this must be set the cost of carriage from Chakrata to Dehra and other expenses, so that the following may be said to be the net revenue under departmental working:—

Departmental Working.

Value of rosin and turpentine turned out	Rs	1,740
Carriage from Chakrata	114	
Charges in Dehra for distilling, tins, jars, etc.	438	
Ten per cent. of cost of still and other plant, Rs 350	35	
One-fifth of pay of Forest Ranger in charge for five months	50	
		<hr/> 637

Net Revenue 1,103

or, per maund of crude rosin worked up, say Rs 5, which is 12 annas to Rs 1 more than we were offered in Chakrata.

"The cost of collection in the forest of the crude resin and its delivery in Chakrata is Rs-2 per maund, so that the profit from the work is on an average Rs-1 per maund under local sales and Rs-14 per maund under departmental distillation.

"Another industry which is just starting, and has, the Conservator thinks, a good future is that of the extraction of tar from roots and refuse of the Chir pine and its boiling down into pitch. Last year 90 maunds of this tar, which resembles what is known as 'Burgundy pitch,' were produced and chiefly used locally for tarring the roofs of houses and the timbers of bridges and fences."

A small quantity of crude resin of *Pinus longifolia* was sent, in 1888, to the Anglo-Indian Varnish Company, who reported on it as follows :—

"The crude turpentine had the appearance and consistency of lard. It was put, without any admixture of water, into a copper still with a worm (an ordinary *pot still*), and gently fired. The material that came out was turbid, and had something the appearance of milk. The residue in the still was a white fatty substance with dirt. The proceeds of the first distillation were mixed with water, and subjected to another distillation, or rather rectification.

"From this process we obtained—

- (I). Oil of turpentine containing in solution a large quantity of resin.
- (II). Oil of turpentine, more or less pure, which was limpid when received from the still, but has since become slightly coloured.
- (III). Oil of turpentine containing a very large quantity of naphtha.
- (IV). Rosin containing a large quantity of oil of turpentine and naphtha

"The rosin thus obtained, on being subjected to dry distillation, gave off a considerable quantity of naphtha and the residue (No. V) is a more pure rosin than No. IV, but still contains much oil, which should not be present.

"We made some copal varnish with No. II when limpid, but found the varnish would not dry, and had a peculiar smell.

"This, we must say, has not been a fair trial. We should have got the oil of turpentine much purer, and it is probably owing to this that the varnish does not dry.

"It is the first time we have attempted to distil the raw material, and have no doubt that further trials would lead to much better results."

A sample of oil distilled by Mr. Fernandez at Naini Tal was examined by Messrs. Morrison & Co., who reported that it was good, but a little wanting in strength. The results of its application in cases of rheumatism were stated to be as good as those obtained with French oil.

Specimens of soap prepared, respectively, with 10 per cent. of turpentine and with rosin manufactured at Dehra Dun have been sent by the North-West Soap Company, Meerut, to the Imperial Institute. The soap prepared with the rosin made at Dehra is darker in colour, but otherwise of nearly as good quality as that prepared with American resin. Recent consignments of rosin sent from Dehra Dun to the North-West Company are reported as being of superior quality to the resin previously sent.

The turpentine manufactured at Dehra Dun has been tried by the Bombay-Baroda and Central India Railway, and found to be of good quality and suitable for railway carriage painting. A more extensive trial is to be made with it.

The following notes on the extraction of crude turpentine from *Pinus longifolia* were prepared by Mr. Lemarchand, Deputy Conservator of Forests, Kangra Division:—

“Experiments were made with reference to the extraction of crude turpentine in 1885 and 1886 with the following results:—

“In March, 1886, 160 Chfl trees, with an average girth of from 4 to 6 feet and age from 60 to 90 years, were selected and marked for experimenting on. In April, triangular-shaped niches, 18" long and 6" deep, were cut into each tree. Men were employed to empty the niches as fast as they filled. The exudation of resin was active in April and May, slower in June, and ceased entirely in July.

“The total outturn of crude turpentine from the 160 trees was $7\frac{1}{2}$ maunds, or an average of 30 chittaks per tree.

“The total cost, including wages of carpenters employed in cutting out niches, coolies collecting the resin, earthen vessels for storing the produce, etc., was Rs 19-8-0, or Rs 2-7-6 per maund.

“The method adopted in 1885 was by making a straight flat cut or scar through the bark. Earthen vessels were fixed to catch the turpentine. This method yielded only 13 chittaks per tree—less than half the quantity produced in 1886—and the cost of production (owing to the number of earthen vessels required) was Rs 5-8 per maund, as against Rs 2-7-6 per maund in 1886.

“The trees tapped in 1885 were again tapped in 1886, but yielded only an aggregate outturn of 16 seers of crude turpentine.

“Experiments were also made on trees that had been burnt in previous years during forest fires. These yielded little or no resin.

“It would probably pay to set up a still for the distillation of the crude article on the spot of production, as there is a sufficient quantity available to compete with the American article. The cost of transport to Karachi, and from there to Madras by sea, prevented the possibility of selling the crude material to Messrs. Morrison & Sons, Anglo-Indian Varnish Manufacturing Company, Madras, whose report on specimens sent to them has already been quoted (p. 18).

“The crude material extracted in 1885 and 1886 was sold at an average rate of Rs 4 per maund.”

2.—*Pinus Khasya.*

The following report was made, in 1885, as to the extent to which *P. Khasya* is available in British Burma:—

Pegu Circle.—The area of the forests of *Pinus Khasya* is found on examination to be only about 3 or 4 square miles; but a large proportion of the forest is covered with young growth, which has sprung up on the sites of old taungya grounds. The tree grows plentifully along the Panlaung ridge itself which forms the boundary of the Pegu and Tenasserim circles, but it only spreads over insignificant tracts to the west or within the Pegu Circle. Pine forests are also to be seen beyond Nat-tung, but they have not been examined. The tree is never tapped for turpentine; the wood is used for torches by the villagers in the neighbourhood.

Tenasserim Circle.—The area of the forests of *Pinus Khasya*, which are only found on the higher hills in the Upper Salween District from an elevation of 3,000 to 7,000 feet, is estimated at from 35 to 40 square miles. This area could only be extended by demarcating certain tracts and State Reserves, but this would seriously affect the Karen population, who subsist wholly by taungya cultivation, and for whose maintenance the existing taungya grounds barely suffice. Judging from the position of these pine forests and their great distance from Papun, the highest point up to which the Yoonzaleen river is navigable for small boats, it is considered doubtful whether their resources in turpentine could ever be made available.

In the *Indian Forester* (February, 1888) it is stated that—

“The resin of the Khasya pine is believed to be the most valuable in India, and has attracted the special attention of Sir Joseph Hooker. Forests of this tree are estimated to cover about 270 square miles, of which 230 are in Assam, the remainder being in Burma. Of the area comprised in Assam, only 33 square miles are at the disposal of Government, the rest being in private hands and regularly subject to jhooming, and, therefore, mostly too young at present to be in a condition to yield. The small area in Burma can, however, it is confidently believed, be largely extended and improved, nothing but fire conservancy being required to transform the hillsides into pure pine forests. But the pine localities in both provinces are far removed from markets, and are so little accessible that the cost of 100lb of crude turpentine delivered at Calcutta and Moulmein would, under present conditions, be ₹32 and ₹36, respectively.

“In Burma the Khasya pine is never tapped for resin. The wood is used for torches by the villagers in the neighbourhood of the pine forests.”

The following note on the extraction of crude turpentine from the wood of *Pinus Khasya* in the Khasia hills, Assam, is taken from a memorandum by Mr. G. Mann:—*

“In the bazars of the Khasia hills a very resinous wood is sold, which is used by the Natives, as well as by Europeans, for kindling fires, and it is very handy for this purpose.

“This wood is produced artificially in *Pinus Khasya* by cutting a hole in the lower part of the trunk of the tree about one foot above the ground. This hole is usually 9 to 12 inches wide, 6 to 9 inches high and 2 to 3 inches deep. After this hole has been cut, the bark and a little of the wood is removed from a strip about 12 inches wide and 4 feet up the trunk just above the hole, which causes the resinous sap to exude, and all the sap-wood along the strip where the bark has been taken off to become thoroughly saturated with resin within the next 12 months; and it is even said that the wood of the smaller branches in the crown becomes much more resinous in trees thus cut.”

For the extraction of liquid turpentine from the wood saturated with resin, the wood is cut into small pieces or chips, and placed in an earthenware cooking pot or vessel till it is full. The mouth of the vessel is closed by tying large, smooth leaves (usually of *Phrynium*) over it; the vessel is turned upside down and placed on a hearth, cut out of the hillside. A gentle fire is then made on or above the vessels holding the wood, and the hot ashes and burning charcoal kept spread over and around the pots to heat them, the consequence of which is that all the turpentine oil exudes from the wood, and drops through the holes made in the leaves into the smaller vessels placed underneath to receive it.

The resinous wood used for the preparation of turpentine sold, in 1882, at the rate of about 80lb for the rupee; and it was stated that sometimes it fetched half as much again, if there was not a very large amount brought to the bazar for sale.

In 1881 Professor H. E. Armstrong, F.R.S., wrote as follows regarding the crude turpentine:—

“It consists of a solid resin similar to colophony, and of a liquid turpentine oil. The latter is remarkably pure and free from smell, and ought, I should say, to be very valuable for purposes for which the French and American oils are used. . . . Neither French nor American oil, especially the latter, are homogeneous, but this *Pinus Khasya* oil, so far

as I can judge from the examination of the small quantity at my command, is almost a pure substance."

A sample of turpentine oil, the produce of *P. Khasya* from British Burma, was sent to Professor Armstrong who reported* that "this oil is in every respect, so far as I have been able to ascertain, the counterpart of French turpentine, but its optical image; and, if it could be obtained in quantity, would form a most valuable article of commerce."

In 1892, the Conservator of Forests, Eastern Circle, Upper Burma, submitted the following note regarding the distribution and utilisation of *P. Khasya* in Upper Burma and the Shan States:—

"The higher hills on which pines occur have been but little explored, and the information recorded below is consequently incomplete. There are probably large areas of pine forest of which we have at present no knowledge.

"In the Southern Shan States Mr. Jackson reports that pine forests occur both in the drainage area of the Irrawaddy and Salween. They are generally situated at altitudes of 4,000 feet and over, though they occasionally descend as low down as 3,000 feet. They are sometimes found forming pure forests, but are more generally mixed with *ingyin* (*Shorea siamensis*), *thitsi* (*Melanorrhæa usitata*), *tankhyan* (*Terminalia tomentosa*), *panmu* (*Schima*, sp.), oaks and chestnuts. The reproduction is invariably good. The trees seldom exceed 6 feet in girth, but east of the Salween, where the largest and best forests are found, trees 9 to 10 feet in girth are not uncommon. The total extent of pine forests in the Southern Shan States is considerable, as there is no State of any size which does not possess some pine-clad hills; but no estimate of area can be given. The most accessible forests are in the Thamakan State on the cart-road from the Meiktila road railway station to Fort Stedman. Pine wood is seldom used for building purposes, as it will not stand the action of rain, but it is sometimes used for interior work in default of other timber. Where pine forests are found in the neighbourhood of villages, the wood is collected and sold in the bazars for torches. An oblique incision, 1 foot long, is made near the foot of the tree, and the resin which at once exudes is fired. This causes the wood near the wound to become so resinous as to be quite translucent when it is chipped off and used for torches. Under such treatment the trees are sooner or later destroyed by jungle fires, or else become so far cut through as to be unable to support their own weight. Resin or turpentine is never collected in the Shan States or elsewhere in Upper Burma.

In the Mandalay Division there is a tract of pine forest occupying the higher hill tops and slopes over an area of about 150 square miles on the Zavgyi river in the Shan States of Yatsank and Baw between Myogyi and Thondan. The pines, which range up to 10 feet in girth, occur either pure or mixed with the trees above noted. The lower slopes are occupied by *In* forests, but groups of pines have been found so low down as 2,500 feet. The pine forest is generally very thinly stocked, and the ground in the more open parts is covered with tufts of short grass. Reproduction takes place abundantly, but the young seedlings are constantly destroyed by the annual fires. The trees are utilised to a very small extent for torches. Pine forests are also said to occur in Mainglôn, a district of Thibaw, but their extent is at present unknown.

In the Ruby Mines District there are some important groves of pines near Bernardmyo and to the north of Mayôk. In the Bhamo district pines are found on the crests of the hills between the Namyin and Indawgyi rivers.

In the Minbu, Yaw, and Chindwin divisions groups and belts of pines are not infrequent on the tops of the secondary ranges between the Chin hills and the Irrawaddy and Chindwin rivers, and in the Chin hills there are

reported to be extensive areas of pine forest, but only the western spurs have as yet been visited by Forest Officers. In the higher hills the wood is said to be generally used for building purposes. Linear valuation surveys made last year in some outlying pine tracts in the Minbu Division gave the following results :—

Area counted out acres.	Trees 6' girth and over.	Trees 4½' to 6' girth.	Trees 4½' to 1½' girth.	Trees below 1½' girth.
439	337	674	936	1,971

Owing to the generally inaccessible situation of *Pinus Khasya* forests and the high cost of labour, the prospects of establishing a trade in the timber appear very remote, but there is no doubt that the trees are regularly

tapped for varnish.

The Conservator proposed carrying out some experiments at Bernard-myo and in the Thamakan State, to ascertain the quantity of resin and turpentine procurable from each tree and the market value of the products.

The following note on the cost of extraction and yield of oil and resin from *Pinus Khasya* in Assam was supplied by the Conservator of Forests, Assam, in February, 1892 :—

"It was estimated by Mr. Mann, in 1884, that to extract the oil in the manner described above cost Rs18-8 per maund of 80lb or 8 gallons. It would now, owing to higher labour wages, roughly cost nearly 25 per cent. more, or Rs23 per maund, and, delivered at Gauhati on the Brahmaputra, it would cost Rs24-8 per maund.

"Mr. Mann's enquiries led him to calculate that 68lb—or, say, 7 gallons—of turpentine could be obtained from a full-grown tree of 4 feet girth, or one-sixth of the raw material used in the process; that trees should have attained the age of 50 years before being tapped, as the tapping process kills the tree; and that not more than 1,000 gallons yearly could be obtained from the entire area under pine forests in the Khasi and Jaintia hills, provided that these latter were protected. In writing the above it was estimated that about 230 square miles were under pine forest, of which only 33 square miles belonged to Government. The above area has probably been still further curtailed by this date, and, so far as my experience is concerned, the existing forests are not 50 years old. The Government forests about Shillong are still in the pole stage, and are probably under 30 years old. Such forests, therefore, according to Mr. Mann, would be immature for tapping purposes. It seems likely, however, that Mr. Mann indicated the above age as the lowest exploitable one because of the fact that the tree is killed by the process of extraction. In France, I believe, much younger trees are made to yield turpentine, and by methods that do not necessarily kill the tree. It would be interesting to experiment on some of our trees with this object."

3.—*Pinus Merkusii.*

It is stated in the *Indian Forester*, February, 1888, that "this pine is only found in Burma, where it covers about 50 square miles in the Thau-gy-in valley in the Tenasserim Circle. These forests are much more accessible than the Khasya pine tracts, and no difficulty is anticipated in extending them by the reservation of suitable tracts, as the population there is sparse

and the tree can be easily propagated. The cost of the *P. Merkusii* resin delivered at Moulmein is the same as that of the Khasya resin, but will be much reduced as soon as the valley is opened up by cart traffic. The few experiments hitherto made seem to show that a tree of 6 feet girth can yield 12lb during the first year in which it is tapped."

In 1885 the following report regarding the turpentine obtainable from *Pinus Merkusii* in British Burma was submitted by the Conservator of Forests, Tenasserim Circle:—

"The area of the forests of this tree in the Thaungyin valley (its habitat) is estimated at about 50-square miles. This area could be extended by propagating the tree over considerable areas in the unreserved forests, and in selected areas within the reserves, where the soil is suitable and where the *In* tree (*Dipterocarpus tuberculatus*) occupies the ground. In fact, there would be no difficulty in doubling the existing area if such means were adopted; and no hardship would be caused to the inhabitants of the surrounding villages if this were done, as the population is sparse in the Thaungyin valley, and the *In* forests, by reason of the poverty of the soil, are not resorted to for purposes of cultivation.

"As regards the cost of collecting the turpentine and delivering it at Moulmein, it has been ascertained that 6 gallons (52lb) of crude turpentine can be obtained from 25 trees in the course of 15 days, at a cost of R6 for hired labour. The cost of transporting these 6 gallons of turpentine from Myawaddi (the source of supply) to Moulmein is estimated at R4-12-0; and the total cost of crude turpentine delivered at Moulmein may, therefore, be estimated at R10-12-0, or R1-13-0 per gallon. Refined turpentine is sold in the Moulmein bazar for about R1-13-0 per gallon, the same rate as crude turpentine could be delivered at Moulmein.

"It is said that, if the turpentine were collected by the Karens and Shans of the Thaungyin valley during their leisure hours (in the same way that forest produce of all kinds is usually collected by them), the actual cost of its collection will be much less (probably by one-half) than the cost of collection by hired labour. It is also expected that, when cart traffic is established between Myawaddi and Kawkaeit (*en route* to Moulmein), crude turpentine might eventually be delivered at from 14 annas to R1 per gallon.

"Experiments show that *Pinus Merkusii* can be tapped for turpentine without killing the tree, and that a tree 6 feet in girth will yield 12lb of turpentine in an ordinary dry season of three months. No information is available as to the average quantity of turpentine which could be obtained from a full grown tree. It is not until a girth of 3 feet has been attained that the tree secretes any appreciable quantity of turpentine. The yield of trees 1 foot and 2 feet in girth has been ascertained to be respectively 8½ oz. and 1lb 7½ oz. in an ordinary season lasting three months.

"As to the total quantity of crude turpentine likely to be available, if circumstances were such as to admit of its remunerative extraction, no definite information is yet available. To ascertain this, it would be necessary to take up a sample area of about 50 acres, and subject only full-sized and larger trees to the tapping process, in accordance with the system in vogue in the forests of Europe. Moreover, the information thus obtained would have to be supplemented by surveys in order to ascertain the average number of trees suitable for tapping purposes per acre, and the precise areas on which tapping operations could be profitably conducted."

In May, 1881, a sample cask of (what was said to have been) turpentine of *Pinus Khasya* was sent to the India Office. In a letter from the Chief Commissioner of Burma, in 1885, however, a belief is expressed that the turpentine then sent was that of *Pinus Merkusii* from the Thaungyin valley.

NOTE ON TURPENTINE.

American turpentine is imported into India from England; French or other turpentine is not known in the Calcutta market.

The turpentine generally sold in the Calcutta market is impure. It is largely adulterated in England with kerosene oil, naphtha, benzoin, &c., and a further adulteration takes place in India. There is very little demand for pure unadulterated turpentine. Purchasers do not look so much for quality as for quantity. Merchants, therefore, keep only small quantities of pure turpentine, which they import direct from America, not through England.

The points of good turpentine are that it is as clear and transparent as glass; that the odour is neither very strong nor bad; that it dries quickly; that, if sprinkled on white paper, it dries at once, leaving no marks behind; and that, when handled, it forms a coating of very fine white dust on the hand. All these properties depend largely on the method of distillation. Any defect in the distillation lowers the quality of the oil. If any attempt is made to introduce the Indian product into the market, the greatest care should be taken in its distillation. Its resemblance to the oil already existing in the market is of far greater importance than its purity. In point of fact, its purity must be destroyed before it is put into the market, and its resemblance to the American oil is the main object which should be kept in view. The Calcutta merchant, from whom the present information was obtained, stated that, on one occasion, a sailor brought to Calcutta a large quantity of pure turpentine which he offered for sale, but that he had great difficulty in disposing of it, because its odour was somewhat different from that of the oil usually sold in the market. It was at length purchased by Messrs. Dykes & Co., the coach-builders.

For internal administration medicinally, pure turpentine is required, but consumers generally buy it from shops for external application, and demand a large quantity for their half-anna or anna. In such cases, they are supplied with stuff very largely adulterated with kerosene oil.

It is estimated that the annual consumption of turpentine in Calcutta is from 10 to 20,000 gallons.

Turpentine is shipped from America to England in tin canisters packed in wooden cases, but it is sent from England to India in iron drums tinned inside, as contact with the iron would discolour the oil.

At the present time the wholesale price of turpentine ranges from Rs 1-12 to Rs 2-9 per gallon in Calcutta.

In the London market the following are recent values of the various turpentines imported, as well as of rosin:—

American turpentine	25/3 per cwt.
" rosin (common)	4/6 "
French turpentine	} none.*
" rosin	
Russian turpentine	19/ and 19/6 per cwt.

American turpentine—

Average values, 1891.

January	29/ and 29/9	July	27/3 and 28/9
February	28/6 and 29/3	August	27/3 and 28/
March	28/9 and 29/3	September	27/9 and 28/6
April	29/ and 30/3	October	27/ and 28/
May	29/3 and 30/3	November	26/ and 26/9
June	28/9 and 29/3	December	25/3 and 26/

* French rosin or turpentine seldom or never comes upon this market now, so that there is no means of recording prices or averages.

American Rosin—

Average values, 1891.

Common strained.

January	4/9	July	4/4½
February	5/	August	4/4½
March	4/9	September	4/3
April	4/9	October	4/6
May	4/7½	November	5/
June	4/6	December	5/

The Dehra turpentine is of very superior quality, but cannot at present be sold at the highest price obtained for the best imported turpentine. It can be sold in Calcutta at $\text{Rs } 1-8$ to $\text{Rs } 1-14$ per gallon, and, if it became established in the market, could probably be sold at $\text{Rs } 2$ to $\text{Rs } 2-4$ per gallon.

The Dehra turpentine cannot, however, aspire to conquer the Calcutta market, which is too far away and requires too much; all it can hope to do is to obtain a good sale in Upper India. Messrs. Lyell & Co. of Allahabad are advertising turpentine at $\text{Rs } 4-8$ per gallon. If the Forest Department could get $\text{Rs } 3$ per gallon, all round, for Dehra turpentine, it would be worth while to build a factory and manufacture it and rosin (which fetches now $\text{Rs } 5-8$ per maund) wholesale.

EDGAR THURSTON,

*Offg. Reporter on Economic Products
to the Government of India.*

K U T.

(THE COSTUS.)

In this hand-book the article in the Dictionary of Economic Products by Mr. W. R. Clark has been reproduced with a few modifications. Its object is to draw attention to a product, collected in Kashmír, which is exported to China and the Straits, where it is largely used as incense. It is also used to protect fabrics from the attacks of moths and other vermin, and from it Kashmír goods derive their peculiar odour.

Saussurea Lappa, *C. B. Clarke*; *Fl. Br. Ind.*, III., 376.

THE COSTUS.

Syn.—*AUCKLANDIA COSTUS*, *Falc.*; *AFLOTAXIS LAPPA*, *Decne.*

Vern.—*Kút*, *kot*, *kust*, *kust-talk-putchuk*, *kur*, *pachak*, *HIND.*; *Pachak*, *kur*, *BENG.*; *Post-khai*, *KASHMIR*; *Rusta*, *BHOTE*; *Kút*, *kot*, *kúst talkh*, *kúth*, *PR.*; *Opplate*, *BOMB.*; *Upaleta*, *kút*, *GUZ.*; *Kostum*, *putchuk*, *goshtam*, *TAM.*; *Changala*, *kustam*, *TEL.*; *Sepuddy*, *MALAY.*; *Goda mahanel*, *SING.*; *Kushiha*, *kashmirja* (according to Stewart), *SANS.*; *Kúst*, *ARAB.* & *PERB.*

Habitat.—A tall, very stout herb, with annual stem and thick perennial roots, indigenous to the moist, open slopes surrounding the valley of Kashmír, at an elevation of 8,000 to 9,000 feet. It occurs also in parts of the basins of the Chenab and Jhelam, at elevations between 10,000 and 13,000 feet. The roots are dug up in the months of September and October, chopped up into pieces, 2 to 6 inches long, and exported without further preparation.

Description.—“*Costus* occurs in crooked twisted pieces about 3 inches long, and from $\frac{1}{2}$ to $1\frac{1}{2}$ inch in diameter, almost always split. Externally it is brown, marked by longitudinal ridges, and has a rough and somewhat reticulated surface. Its substance is compact and brittle, the fractured surface having a resinous appearance and dirty white colour. The central portion is generally absent, and appears to have been removed by decay before the root was collected. The taste is bitter, pungent and camphoraceous; the odour resembles that of fresh violets or orris root.” (*Pharm. Ind.*)

Chemical Composition.—According to the *Pharmacopœia Indica*, the odorous principle of the drug appears to consist of two liquid resins, one of which possesses in a very marked degree the odour of the drug, and a somewhat camphoraceous taste, while the other possesses a musty odour. In addition to these resins evidence of an alkaloid, an astringent principle, and a solid resin has been obtained.

History.—Dr. Watt has already written at some length on this subject, and his remarks may therefore be reproduced :—"It would seem that for a long time *Costus* Root or *kust* was referred to a species of *Scitamineae*, most probably from the resemblance of the scent to that of *Orris* root. The genus to which it was attributed received the name of *Costus*, the perfume being said to be obtained from *C. arabicus*, Willd. The common and elegant plant of our jungles, *Costus speciosus*, Sm., was supposed to be nearly allied to the hypothetical species *C. arabicus*, but to be scentless. It is remarkable that, while it has now been clearly proved that the plants which belong to the genus *Costus* have nothing to do with the *Costus* root of the ancients, the vernacular names *koo*, *kust*, should in Bengali be given to *C. speciosus*, names which are also applied to the true *Costus*. The resemblance of the root to *Orris* or *Iris*, a plant nearly allied to *Costus speciosus*, is another remarkable coincidence. Falconer, in *Linn. Soc. Trans.*, Vol. XIX., Part I., 23 (1842), proved beyond doubt that the *kust* of Upper India was the root of what he called *Aucklandia Costus* (since reduced to *Saussurea Lappa*), and he concluded that this was the *Costus* of the ancients for the following reasons :—

- "1st—It corresponds with the descriptions given by the ancient authors.
- "2nd—Coincidence of names. In Kashmir the root is called *kust* and the Arabic vernacular is said to be *kust*, both being given as synonyms by the Persian *hakims*; they are also the names by which the medicine is known in all the bazárs of Hindústan Proper. In Bengal the Kashmir root is called *Patchak*, and it appears by a note in Dr. Royle's illustrations that Garcia ab Horta gives *Pucho* as the Malay synonym of *Costus arabicus*.
- "3rd—*Koot* is used at the present day for the same purposes in China as *Costus* was formerly applied to by the Greeks and Romans.
- "4th—The direct testimony of the Persians that *kust* comes from the borders of India, and that it was not a product of Arabia.
- "5th—The commercial history of the root gathered in Kashmir under the name of *kust*." (*Dr. Dymock, Mat. Med.*)

"This root is collected in enormous quantities in the mountains of Kashmir, whence it is conveyed to Calcutta and Bombay, and thence shipped for China. The drug has a pungent, aromatic taste, and an odour resembling that of *Orris* root. There is an excellent account of it, with a figure, in Professor Guibourt's *Histoire des Drogues*, tome iii. p. 25. (*Science Papers by D. Hanbury*, 257.) *Costus* root is remarkably similar to *Elecampane* both in external appearance and structure: *Costus* has been an important spice, incense, and medicine in the East from antiquity down to the present day; it would be of great interest to examine it chemically with regard to *Elecampane*." (*Pharmacographia*.)

Kust is collected in large quantities in Kashmir and exported to the Panjáb, where it finds its way all over India and is shipped from Bombay and Calcutta to China and the Red Sea, a small quantity finding its way to Europe. Falconer describes two forms—*kust-i-talk* and *kust-i-shirín*, the latter being the chief article of commerce. (*Watt, Calcutta Exhib. Cat.*, V., 252.)

Uses.—As already indicated, the roots are a valuable perfume, and yield excellent pastilles, which burn fairly. Stewart remarks that the loads of roots when passing scent the air to some distance. "It is," Baden Powell writes, "exported in enormous quantities to China, where it is used as an incense. In every Hong it is found; no mandarin will give

an audience until the *patchak* incense smokes before him ; in every Joss house it smoulders before the Tri-budh deity ; in every floating junk in the Chinese rivers, the only house of countless hordes, Budh's image is found, and the smoke of the *patchak* religiously wends its way heavenward."

The root is largely used as a hair-wash, and is said to have the power of turning grey hair black. Formerly, when opium was not produced in Rajwarra, it was extensively smoked as a stimulant, and great quantities also went to China for smoking purposes. It is universally employed, according to Baden Powell, by Kashmir shawl-merchants as a protector of their fabrics from the attacks of moths and other vermin. Kashmir goods owe their peculiar odour to it. It is brought into Bengal by Panjābi and Marwari merchants, and retailed by spice-sellers.

Carminative, astringent, sedative, and prophylactic properties have been referred to the root. The Chinese apply it with musk to aching teeth. Stewart says that it is officinal in the Panjāb, being applied in powder to ulcers, for worms in wounds, and for toothache and rheumatism. Baden Powell says that it is used as an ingredient in a stimulating mixture for cholera.

Trade.—The quantity collected is very large, amounting, according to Dr. Falconer, to about 2,000,000 pounds per annum. It is laden on bullocks and exported to the Panjāb, whence the greater portion is sent to Bombay and Calcutta. A great part of the imports into Bombay and Calcutta is exported to China and the Red Sea. In Kashmir it is a Government monopoly ; each village in the vicinity of the *kut* fields is assessed at a fixed amount which has to be delivered in the capital, and the surplus is bought up by the agents of the Maharāja and retailed again to dealers for export to Hindústān. In 1864 the revenue, obtained by the Kashmir State from the sale of *kut*, was said to have amounted to nearly ₹1,90,000. According to Dr. Falconer, at the time he wrote, the cost of collection and transport to a depôt in Kashmir was 2s. 4d. per cwt. ; on entering India its value was enhanced to from 16s. 9d. to 23s. 4d. per cwt., while its commercial value at Canton was 47s. 5d. per cwt.

At the present day from 7,000 to 11,000 cwt. of the roots are, on an average, shipped annually from Calcutta for the use of the Chinese and Japanese, and the consumption could be increased if the roots could be obtained at a cheap rate. The price varies from ₹20 to ₹25 per cwt.

The following were the exports of the roots from Bombay during 1891 :—

To China (Hong-Kong)	3,200 cwt.
„ The Straits (Penang and Singapore)	237 „
	<hr/>
	3,437

Adulteration.—As regards the adulteration of the roots it is stated in the *Pharmacographia Indica* that “the natives of Kashmir say that this drug is apt to be adulterated with five or six other kinds of roots. In 1859 a communication was made to the Agri-Horticultural Society of India of two roots, one called *kút* and the other *thúth*. They were from the hills of the Kangra district bordering on Chumba. The *kút* was identified as the *Costus*, and the *thúth* was believed to be the root of *Salvia lanata*, which was said to be common also in Kashmir, where it is used to adulterate *kút*. Subsequently Mr. H. Cope of Amritsar contributed some remarks to the same Society on the adulterations of this drug. “This adulteration,” he says, “is now (1860) carried to such a pitch with the assistance not only of the *thúth* (which so closely resembles the

Adulteration.

genuine article in every respect but its qualities that it is difficult to distinguish the one from the other after admixture, which imparts to the false the odour of the true drug), but with other foreign substances (of which cow-dung is one) that I have ascertained as a fact that the more unscrupulous dealers use some 10lb of the *kút* to flavour 50lb of trash. I am told that two other substances, resembling the genuine article in exterior appearance, have been ascertained to serve as ingredients in the mixture sent to Calcutta and Bombay for exportation to China under the name of *patchak*. They are a root called *chog*, brought from the hills, which is generally reported to be a deleterious drug, and *nirbis*, the root of a species of *Aconitum*,* probably a virulent poison. With regard to Mr. Cope's remarks, we may mention that there is no difficulty in obtaining genuine parcels of *Costus* in Bombay. Perhaps the adulterated article may be specially prepared for the China market."

In Bengal *kút* is adulterated with the root of *Lagenaria vulgaris* (Bottle Gourd). When this plant is mature, the root and a portion of the stem are cut into small pieces, which are steeped for some time in an infusion of real *kút*. In this way they are so saturated with the smell of the *kút* that it is difficult to distinguish them from the genuine article. The only way to distinguish them is to cut them with a knife. The true *kút* roots cut sharp and clean, whereas those of the gourd present a lacerated surface.

EDGAR THURSTON,

*Offg. Reporter on Economic Products
to the Government of India.*

* In the Dictionary of Economic Products the principal adulterants are said to seem to be a species of *Ligularia* and one of *Aconitum*.

CUTCH.

In this hand-book the article in the Dictionary of Economic Products by Dr G. Watt has been considerably modified by the incorporation of information derived from reports specially called for in connection with the collections made for the Imperial Institute. Its object is to specially draw attention to the cutch industry in Burma, the process of manufacture, and the present extent and future prospects of the trade.

Vernacular.—*Kat* or *kath*, *kalthá*, HINDUSTANI; *Khayer*, BENGALI; *Kát*, MARATHI; *Kdho*, GUZERÁT; *Káshu-kalla*, *káshu*, TAMIL; *Katti*, *káshi-katti*, MALAYALM; *Kachu*, KANARESE; *Kaipu*, SINGHALESE.

HISTORY.

At the present day, by far the most important product of *Acacia Catechu* is the resinous extract (Catechu) obtained by boiling down a decoction obtained from chips of the heart-wood. The practice of preparing this extract has been handed down from remote periods. The Sanscrit authors mention the drug, and Barbosa, in his description of the East Indies published in 1514, mentions what is, in all probability, this drug under the name *Cacho*. He states that it was at that time exported from Cambay to Malacca. *Cacho* is apparently the Kanarese word *Káchu* now applied to it. It is, in fact, probable that the word Catechu is a modern Latin derivative from the South Indian name, and that from South India the product was first exported. Some authors, however, say that it is, derived from the Cochin Chinese word *Caycau*. One of the Tamil names for the plant is *Kati*, *Kuti*, or *Cate*, and the second half of the word may have been derived from *Chuana* "to drop or distil." Whatever may be the origin of the word catechu, it would save much ambiguity if it could be restricted to the extract from *Acacia Catechu* instead of being made popularly to include one or two other substances, such as gambier, a word of Malayan origin signifying "bitter," and applied to a purely Malayan product (*Uncaria Gambier*). It is quite true that both these astringents contain the same chemical properties, but they are obtained from widely different plants and manufactured in countries separated from each other. In our *Trade and Navigation Returns* the exportation used to appear as 'Cutch and Gambier,' from which one would naturally infer that both cutch (or catechu) and gambier were exported from India, the relative proportions of which had not been determined. I am informed, however, by my friend Mr. J. E. O'Connor that this practice was a remnant of the time when the Straits Settlements returns were published with those of India.

In the Kew Bulletin of Miscellaneous Information, February, 1891, it is stated that "gambier must not be confounded with a substance manufactured in India from an entirely different source, namely the wood of two species of *Acacia*, *A. Catechu*, and *A. Suma*. This is called *Cutch*, or *Black Catechu*. Its composition is very similar, however, to that of gambier.

"The latter, when met with in commerce, is an earthy-looking light brown substance, consisting of cubes about an inch each side, more or less agglutinated. Cutch, on the other hand, is met with in dark brown masses, hard and brittle on the surface and at first softer within. It breaks easily when dry with a shining granular fracture.

"It is, however, curious that there is a form of cutch which a good deal approximates to gambier. This is called *Pale Cutch*.

"From the time Barbosa wrote in 1514 we have no further mention of this substance till 1574, when Garcia de Orta gave a complete account of the plant and the process of preparation of the extract, describing it under its Tamil name *Cate* (*kali* or *kuti*). It was not, however, until the seventeenth century that catechu attracted the attention of Europe. It was then supposed to be a natural earth, and as it reached Europe by way of Japan (being simply re-exported from that island) it received the name of Terra Japonica. At this period, or shortly after, gambier also found its way to Europe, and was, indiscriminately with catechu, called Terra Japonica. Cleyer exploded the mineral notion regarding Catechu, and in 1685 republished Garcia de Orta's account of the preparation of the extract, and declared it to be of Indian origin, the best quality coming from Pegu and other sorts from Surat, Malabar, Bengal and Ceylon.

"Catechu (from *Acacia Catechu*) was received as an official drug into the *London Pharmacopœia* of 1751. It was official in the *British Pharmacopœia* of 1864, but has since been discarded and Gambier retained, both in Great Britain and India, as the official form of the drug Catechu. In the *United States Pharmacopœia* catechu (from *A. Catechu*) is retained, however, as official and Gambier discarded."

INTERESTING ETHNOLOGICAL FACTS CONNECTED WITH THE CATECHU INDUSTRY.

"Before passing to discuss the chemical properties and modes of preparation of cutch (kutch) and kath, the digression may be regarded as not altogether inappropriate to say something of the race of people who, from time immemorial, have made it their sole occupation to prepare this extract. A brief history of this nature it is thought may help to throw some light upon questions connected with the early history of the drug, and may prove interesting to those who have not the opportunity of consulting the voluminous gazetteers and official records from which it is extracted. In his *Himalayan Districts* (which constitutes Vol. X of North-Western Provinces Gazetteer) Mr. Atkinson says: 'The men employed are of the *Dom* caste, and are called *khairis*, from the vernacular name of the tree.'

"In the *Bombay Gazetteer*, Vol. XIII, an interesting account of the *kathkaris* is given, of which the following synopsis contains the most

interesting features. It is stated that the *kathkaris*, or makers, are believed to have entered the district of Thana from the north and to have settled in the *Gujerāt Alhéviri*, the present district of Surat. According to their story, they are descended from the monkeys which the god *Ram* took with him in his expedition against the demon-king of Ceylon. They are darker and slimmer than other forest tribes. They have a peculiar language of their own, but in conversation they have a tendency to reduce words and shorten speech, and uniformly endeavour to get rid of the personal, not the tense, inflections of the verbs. The women are strong and healthy, and pass through child-birth with little trouble or pain. They are said sometimes when at work in the fields during the rains, to retire behind a rice-bank and give birth to a child, and after washing it in the cold water, to put it under a teak-leaf rain-shade and go back to work. They are divided into two sections—*Sous* or *Marathas* and *Dhors*. The former do not eat cow's flesh, and are accordingly allowed to draw water from the village well. They are also more or less a settled tribe. Some of them still make *kath* or catechu, but from the increase of forest conservancy the manufacture is nearly confined to private *indm* villages and to forests in Native States. When they go to the forests to make catechu, they hold their encampment sacred, and let no one come near without giving warning. Before they begin their wood-cutting, they choose a tree, smear it with red-lead, offer it a cocoanut, and bowing before it ask it to bless their work. The catechu is made by boiling the heart-juice of the *khair* tree, straining the water, and letting the juice harden into cakes. The *kathkaris* will never go in for regular cultivation; they eat rats and monkeys, and live chiefly upon jungle produce, or by theft, stealing from fields and barns.

"In the tenth volume of the *Bombay Gasetteer*, p. 48, it is further stated that the '*kathkaris*, a wild forest tribe in the Ratnagiri District, who subsist entirely by hunting, now that their more legitimate occupation of preparing catechu, *kath*, has been interfered with, habitually kill and eat monkeys, shooting them with bows and arrows. In order to approach within range, they are obliged to have recourse to stratagem, as the monkeys at once recognise them in their ordinary costume. The ruse usually adopted is for one of the best shots to put on a woman's robe (*sári*) under the ample folds of which he conceals his murderous weapons. Approaching the tree on which the monkeys are seated, the disguised *shikari* affects the utmost unconcern, and busies himself with the innocent occupation of picking up twigs and leaves. Thus disarming suspicion he is enabled to get a sufficiently close shot to render success a certainty.'

"In the villages of Navágám, about 7 miles north-east, Gangadia, 11 miles south, and Nelsa, about 9 miles south-west of Dohad, every year on the day after *Holi* (April) a ceremony called the *chul* or 'hearth' takes place. In a trench 7 feet by 3 and about 3 deep, *kher* (*Mimosa Catechu*) logs are carefully and closely packed till they stand in a heap about 2 feet above ground. The pile is then set on fire and allowed to burn to the level of the ground. The village *Bhangia* or 'sweeper' breaks a cocoanut, kills a couple of fowls, and sprinkles a little liquor near the pile. Then, after washing their feet, the sweeper and the village headman walk barefoot hurriedly across

the fire. After strangers come to fulfil vows, and giving one anna and a half cocoanut to the sweeper and the other half cocoanut to the headman, wash their feet, and, turning to the left, walk over the pile; the fire seems to cause none of them any pain." (*Bombay Gazetteer*, III, 310.) At the village of Chosala, about 7 miles north of Dohad, a stream runs into a cave, and on this spot an image of *Mahadev*, under the name of *Kedāreshvar*, has been set up. The place is sacred to the Bhils.

"Many other similar ceremonies and sacred practices might be mentioned, showing that the preparation of catechu dates back to the remotest antiquity. The tree is sacred to *Mangala* or *Karttikeya*, one of the Hosts of Heaven. It receives special worship, and is often mentioned in the Vedas."

CHEMICAL COMPOSITION.

"Catechu contains a variety of tannic acid called mimotannic acid which is soluble in water, and *catechu* or catechuic acid, which is insoluble. Mimotannic acid differs from tannic acid in yielding a greenish-grey precipitate with ferric chloride, and by not producing pyrogallic acid when heated. The destructive distillation of cutch yields pyrocatechin. Quercetine is stated to be contained in cutch. This principle is the yellow crystallizable substance to which the bark of *Quercus tinctoria*; Oliver, owes its colour. (*Dr. C. T. Hislop Warden*.)

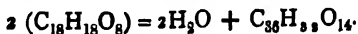
"The chemistry of the catechus has occupied the attention of chemists for some time back, but as yet the views and conclusions arrived at are somewhat conflicting, and the subject may be regarded as still involved in considerable obscurity. The brief chemical note (above) which Dr. Warden has supplied, may be regarded as an abstract of all that is known. In his *Science Papers* D. Hanbury suggests that the process by which the various kinds of cutch, catechu, and gambier are obtained should be carefully studied by persons who have the opportunity of doing so on the spot, that the trees yielding each of the forms of these substances should be accurately recorded; for, he adds, 'we wish to identify the trees with the respective extracts.' It would seem that our ignorance upon these important points may have much to do with the conflicting chemical results which at present exist regarding the composition of cutch. There are at least two, if not three, distinct products obtained from each of the cutch-yielding trees, and it is just probable these may have been experimented upon indiscriminately by the chemists of Europe. It would be but in keeping with other instances of two or more species (still more so of members of different natural orders), yielding approximately the same product, to find that the trees which afford the cutch of commerce produce substances chemically dissimilar. Some such explanation may be found in the future to account for a certain number of the conflicting opinions which at present exist regarding the chemical composition of cutch and its derivatives. A similar example may be mentioned in the fact that *Aconitum Napellus* yields a different alkaloid from *A. thers*

although both species have hitherto been used in the preparation Aconitia.

"Pegu catechu," when immersed in cold water, turns whitish, softens, and disintegrates, a small portion of it dissolving and forming a deep-brown solution. The insoluble part is Catechu in minute acicular crystals. (*Fluck. and Hanb., Pharmacog., 243.*) When the crude cutch of commerce is subjected to a dry heat of 100° , or 100° in an atmosphere of hydrogen, it fuses and becomes transparent, losing 4 to 5 per cent. of its weight. It melts at 140° without further loss of water. On ignition there is left 3 to 4 per cent. of ash. If pure it should be completely soluble in boiling hot water, the solution precipitating the insoluble crystals of catechuic acid on cooling. Ether extracts from cutch its catechu or catechuic acid, so that by precipitation from a hot solution, or by means of ether, this substance may be separated for chemical or industrial purposes.

"In addition to catechin, cutch contains, however, other two substances, *vis.* mimotannic acid and a gummy extractive principle. Mimotannic acid is soluble in cold water, and by simple maceration may therefore be removed from cutch. The solution will be observed to be of a thick chocolate colour. If heated to the boiling point it is rendered quite transparent, becoming turbid on cooling. With this solution ferric chloride gives a dark-green precipitate, which will immediately change into purple on the addition of cold-water, or of an alkali.

"Catechuic and mimotannic acids are present in cutch in about equal proportions. The effect of heat upon cutch and its compounds is most important, and, as pointed out by Etti, the chemical changes effected by heat afford the most likely explanation of the discordance of authors as to the formula for catechin. According to Liebermann, confirmed by Etti's re-examination of the substance, the formula for catechuic acid or catechin is $C_{18}H_{18}O_8$. If a piece of cutch be first heated in a crucible and then macerated, it will be found to be completely soluble in cold water. This is explained by Etti as due to the formation of soluble anhydrides from catechin, thus:



"The compound thus produced is known as catechutannic acid, and is completely soluble in cold water. By a further loss of water at 190° — 200° this becomes $C_{38}H_{30}O_{13}$. Under the influence of heat the anhydride that is first formed is $C_{38}H_{34}O_{13}$, an insoluble, brownish red, amorphous powder, a substance soluble in alcohol and precipitated in crystals by lime water. These compounds, if formed, in varying proportions, in a piece of catechu, would greatly tend to produce conflicting chemical formulæ in the results of different experiments, and a piece of catechu, which is found to be completely soluble in cold water, should be regarded as inferior in quality (injured through heat) and most probably adulterated by the trader.

"For some time Gautier regarded the catechin of Gambier as quite distinct from that obtained from catechu, but in his more recent publications, he admits them as identical. He now corrects his formula, $C_{18}H_{18}O_8$, which he published as expressing catechin (adopted in

Flück and Hanb., Pharmacog.), into $C_{10}H_{20}O_8$ and suggests for this compound the name of Methyl catechin.

"The soluble catechu-tannic compounds constitute the active astringent principle of the drug, and the tanning and dyeing property for which it justly holds so high a position for industrial purposes.

"*Preparation of pure catechin.*—Etti directs that catechu should be dissolved in about eight times its own weight of boiling water, and the liquid, after being strained through a cloth, should be set aside for some days until the insoluble catechin subsides. This should then be collected and placed under a screw-press, being thereafter dissolved in a sufficient amount of dilute alcohol and the filtered solution shaken up in ether. The ether is next removed by distillation, and the crystals obtained washed repeatedly in pure distilled cold water. It is then found to exist in the form of almost colourless crystals." (*Dict. Econ. Products of India*, pp. 36-38.)

FORMS OF THE CATECHU EXTRACT.

There are three substances, all very similar in chemical composition, derived from *Acacia Catechu*, viz. dark catechu or cutch; Indian pale catechu or kath; keersal.

1. Dark catechu or cutch, which is used for industrial purposes, is made into great masses surrounded by leaves, balls, cubes or irregular-shaped pieces, or broken into small blocks. In colour it is externally of a rusty brown, internally of a dirty orange to dark liver colour, in some cases almost black, in others port-wine coloured. It is inodorous, with an astringent bitter taste, followed by a sense of sweetness. It is brittle, and breaks with a more or less resinous and shining fracture.

2. Pale catechu or kath is a grey-coloured crystalline substance; which, under the microscope, is seen to be made up of agglutinated masses of needle-shaped crystals. As sold in the bazárs it occurs either in irregular pieces or in square blocks similar to the dark orange-brown cubes of catechu. This is the substance eaten by natives in their *pan*, which imparts with lime the red colour to the lips and teeth. Continued use blackens the teeth.

3. Keersal is a pale crystalline substance obtained from cavities in the wood of *Acacia Catechu*, where it "occurs in small irregular fragments like little bits of very pale catechu mixed with chips of reddish wood." (*Dymock.*) It is much valued in medicine by the Hindus, and fetches a high price.

In the Calcutta market, in addition to gambier imported from Singapore, three sorts of catechu are known, viz. Janakpuri, Telá and Burmah or Pegu. Of each of these there are different qualities which vary in price.

Janakpuri (pale Catechu) is brought to Calcutta from Patna. A small quantity also comes from Cawnpore, but the product of the North Western Provinces is almost entirely used for internal consumption and for export to the Panjáb, Berars, and Bombay. The price of Janakpuri varies from Rs 12 to Rs 20 per cwt. It and gambier are considered *pan* for chewing with *pan*.

Telá (dark Catechu) is also brought to Calcutta from Patna, and is either sold in the crude state or refined. Of telá there are two varieties, called telá proper and mansárámi, of which the latter is the better quality. In the refining process the catechu is first dissolved in cold water, the solution evaporated by boiling, and the residue cast into two shapes, round or belguti (from *Bél*, the fruit of *Egle Marmelos*, which it resembles), and square, called Chauká or Kálagarán. The price of telá varies from ₹7 to ₹10 per cwt.

Neither Janakpuri nor Telá is exported to foreign countries.

Two kinds of Burma catechu are imported into Calcutta, viz. the dry and the soft. The present price of soft catechu is ₹12 per cwt., and of dry Catechu from ₹22 to ₹28 per cwt.

Bombay cutch is said, in the *United States Dispensatory*, 15th Ed., to yield a higher percentage of tannin than Bengal cutch, but it is commercially almost unknown outside the Presidency. Birdwood describes four forms of it:—

- (1) Kauchá of Dharwar, flat, round cakes, 2 inches in diameter and one inch thick; dark-brown in colour, and preserved in bairi husks.
- (2) South Konkan, covered with paddy husks.
- (3) Khandesh, in angular grains, pale earthy brown internally, darker externally.
- (4) Surat, in irregular lumps from the size of a hazel-nut to a walnut.

Madras cutch is said to be, in all probability, the product of *Areca Catechu* (the Betel-nut Palm). Dr. Mooden Sheriff states that the natives of Madras do not know that *Acacia Catechu* yields cutch, although the tree is common in the Presidency.

SELECTION OF TREES FOR FELLING.

In a recent note on cutch manufacture in Burma Mr. Corbett, Deputy Conservator of Forests, says that in places where trees are scarce they are taken as they come, but that, if they are at all plentiful, the cutch manufacturer is fastidious in his choice, making an incision into the heart-wood before felling, so as to determine whether or no the wood is spotted or whether it contains ugi (the Burman name for keersal), as he knows full well that wood containing this turns out hard cutch, or, as he expresses, that the presence of ugi makes the cutch sleep; and, as hard cutch always fetches a higher price in the market than soft, the presence of ugi is a point of primary importance, and trees without spots are rejected if there is a sufficiency of trees with spots.

"The presence of ugi," Mr. Slave writes, "is one of the principal elements of success in cutch-boiling. From trees rich in ugi, Sha-ma (hard cutch) may be obtained all the year round; hence a cutch-boiler is always on the look-out for them. He professes to be able to discover them at a distance, as he says that they have a rugged, light-grey bark,

the mankind, and are usually found on the trunk of a tree covered a tree which he supposed to contain heart-wood on two sides. At first the ugyi are not visible, but after seven or eight hours they begin to appear, and when the cutch-boiler re-visits his blazes on the following morning, they are quite apparent. If a dead tree be blazed in a similar manner, the ugyi, if present, are apparent at once.

"According to the position of the ugyi in the section of the tree, the woods are classed by the cutch boilers as follows:—

- I.—Tè-lon-byà , *i.e.* all over the section.
- II.—Pat-yan, *i.e.* in a circle.
- III.—Swè-bauk, *i.e.* on one side only.

"Ugyi are mostly found in Sha-ni (red), seldom in Sha-wa (yellow) and never in Sha-net (black) or Sha-byà (blue) catechu trees; always in the heartwood, never in the sap-wood.

"Noticing the effect of these ugyi on the cutch, and believing that the addition of a few handfuls of lime would serve the purpose equally well the cutch brokers some years ago ordered their agents to try the experiment. The soft cutch certainly turned out hard, but the lime was immediately detected by the merchants, and the cutch could not be disposed of at any price. This seems rather absurd, as it is generally supposed here that the English market cannot tell good cutch from bad, but the fact remains the same, and no cutch-boiler will now add lime under any circumstances. I may relate, *en passant*, that for the last three years a gentleman has been buying pure cutch in the district, and boiling it up again with 25 per cent of godown sweepings. This he sells in the English market, and I am informed by the agent of a rival firm that this adulterated stuff fetches as high rates in the home market as the best cutch that can be shipped from Burma."

In a note on the manufacture of katha in Kumaon (North-Western Provinces), by Messrs. Hobart Hampden and Blanchfield, Divisional Officers, it is stated that, in choosing the trees, the objectionable practice of chipping them is adopted, and, on the following day, the blaze is examined, and those trees are felled in which there is a white appearance. It has been established by experiment that trees rejected by khairias as unsuitable do yield katha, though not in quite as great abundance as the trees which show the white spots. Mr. Hobart Hampden reports that he found that 40 trees without white spots, which had been rejected as unsuitable by the katha makers, yielded 2 maunds 18 seers 12 chataks of katha as against 3 maunds 25 seers yielded by 40 trees containing white spots.

MANUFACTURE OF CATECHU.

I.—BURMA.

The ordinary process of manufacture, as carried on in Lower Burma, has been described as follows in the report by Mr. Corbett, Deputy Conservator of Forests, already referred to:—

"The trees having been selected are felled and dragged to the cooking place, where they are deprived of bark and sap-wood, and cut up into

whether it will set. When it becomes hard it is put back into the cauldron and re-melted. A small quantity of *shaw* (*Terminalia Oliveri*) bark is added to give a good colour to it and harden it. It is then thrown into small conical moulds made by pressing a blunt-pointed stick into the ground and lining the holes thus made with leaves of either *Cassia Fistula* or *Bauhinia* sp. When the cutch has solidified, the leaf moulds are stripped off the cakes.

"This cutch is made especially for the Shán market, and is only used for chewing, and fetches at Bhamo from Rs4 to Rs30 per cwt. The adulteration with *than* is strictly illegal, but, as it gives the cutch a good colour and the Sháns are said to prefer it in this form, the manufacture has not been interfered with. The quantity produced is very small.

"From the Sinbyugyun forests of the Minbu Division of Upper Burma I have received specimens of three varieties of cutch, known as black, red, and yellow cutch respectively.* The colours are said to be much more apparent when the cutch is fresh from the boiler. The Deputy Conservator of Forests, Minbu Division, informs me that they are all manufactured by the ordinary Burmese process, the only difference being that the shape of the mould is different, their dimensions being 3' x 8" x 1", and that, before the block of cutch has thoroughly set, it is cut into strips about 3 or 4 inches wide, and the block cutch then assumes the form of the slabs found in the market, the dimensions of which are generally 3' x 8" x 1". The classification into the three classes is, apparently, an after-thought of the merchants, and it has not yet been determined to what the characteristic colours are due. This is a point which can only be cleared up by analyses. The cutch is, I believe, undoubtedly pure

"In the Padaung township of the Prome District a few solitary boilers adopt a different process of manufacture, the product being entirely used for chewing. No iron pans are used. The chips are boiled in the pots in the usual way, and the liquid is then poured into other pots and again boiled until most, but not all, of the water has been driven off. The extract is then poured into a wooden trough about 4' long by 1½' broad by 1' deep, in which it is agitated constantly by a long stirrer until it commences to solidify. It is then rolled up into balls about the size of a marble, which are placed on palm leaves spread on a bamboo mat, which is then put on a framework about 2 feet from the ground, and a fire, which has to be carefully tended, is lit under it. As soon as the balls begin to swell slightly they are taken off the mat and are ready for market, where they fetch about Rs30 per. cwt."

* "Cutch boilers recognize four varieties of *Acacia Catechu*, distinguished by their bark and the colour of the heart-wood, viz. —

Sha-ni, or Red cutch.
 Shaw-wa, or Yellow cutch.
 Sha-bya-kyaung-mwa, or Blue cutch.
 Sha-net, or Black cutch.

Of these four varieties the Red cutch is considered the best; the cutch manufactured from the Blue cutch will never 'set' by itself; so, it is always mixed with the cutch from one of the other varieties." — (H. Slave, Cutch Manufacture in Burma, *Indian Forester*, 1891.)

II.—N.-W. PROVINCES.

The following note on the manufacture of Catechu in the Kumaon* Forests was supplied by Mr. Hobart Hampden, Divisional Officer:—

"The boiling places or furnaces (*bhallis*) consist of platforms some 6' square made of clay with four furnaces in the shape of holes running underneath, from one side penetrating almost to the other side, with three openings to the surface in each. Upon these the earthen pots (capable of containing some 2 pounds of water) are boiled. The fire is kept steady and very hot. The heart-wood of the trees felled is chopped into small thin bits 1 or 2 inches long, which are placed in the boiling pots. The twelve pots are filled two-thirds full of chips, and one-third of water. When the water has evaporated to half-way down the chips, what remains is taken out of eight of the pots and placed in the other four. The eight pots are then refilled. As soon as the liquid contents of the four pots are somewhat further decreased by evaporation they are poured into a trough made of *Moringa* wood, and castor-oil seed of the weight of half a pice is added, and left while the four pots are again filled with water, the old chips remaining. In half an hour to an hour a sort of cream forms upon the surface of the contents of the *Moringa* trough, which is carefully skimmed off and thrown into a pit in the ground where it is left until the pit is filled. Then the katha is taken out in cubes of a foot in diameter, dried for two or three days, further cut up and further dried. The eight pots into which fresh water was poured are dealt with in the same way, the process being gone through of pouring the liquor into the four pots. The chips from which the katha has been extracted are utilized a second time, being taken out, put into another trough, and soaked in 4 or 5 seers of water, which is used for boiling with fresh chips.

"The katha boilers in Kumaon pretend that a magic process is gone through with the katha in the pit, which is carefully covered or hidden from view. But the utility of this is probably that the cooling process is gone through at a lower temperature than if the pits were open."

Mr. Blanchfield, Divisional Officer, states that he is informed that during the boiling a stick dipped in castor-oil is used to stir the liquor, and that this is said to prevent the pots boiling over. He further points out that in Kumaon twigs are not dropped into the concentrated katha to aid crystallization, as is said in the Dictionary of Economic Products to be done.

There appears to be a fair local demand for the Kumaon katha, but the manufacture and trade are in the hands of a poor unenterprising people, and there does not seem to be any present promise of much expansion. The khairias refuse to undertake the manufacture except in tracts where the water supply is ample and convenient, and some of the Kumaon forests are badly situated in this respect.

As regards the manufacture of katha in Gorakpur (North-Western Provinces) and Kheri (Oudh) Mr. Hill, Deputy Conservator of Forests, recently prepared the following note:—

"After the khair tree has been selected and felled, it is barked and

* The product produced in Kumaon is nearly pure catechu known as Katha.

cut up into lengths of 6 to 9 feet, the sap-wood removed by an axe, and the remaining khairaha's (native manufacturers') encampment. This is invariably in the vicinity of water, on the bank of a river or near a lake, and there the manufacture of katha in all its stages is carried on.

"The log of heart-wood having been propped up against two poles, two men proceed to cut it up into chips, which are removed by women and boiled in earthen vessels placed on a long furnace. The furnace, which is made of clay, varies from 10 to 30 feet in length, and is about 2' 6" broad and 2' deep. It is studded with three parallel rows of holes in which the earthen vessels are placed. A vessel on one of the side rows having been filled with chips, sufficient water to cover them is poured in and boiled. When most of the water has evaporated the vessel is again filled with water, and, after the chips have been boiled in all for about three hours, the resulting brown-coloured liquid or extract is poured into one of the vessels in the centre row. The chips are thrown away, fresh chips are put in, and the operation is repeated. The liquor in the central vessels is allowed to boil until it has become of such a consistency that it drips very slowly from a ladle dipped in it. It reaches this state in about three hours. The centre vessels are emptied about four times a day into another vessel, which, when full, is taken away and emptied into a wooden trough inside a grass hut. Four wooden troughs are arranged round a circular vat, which consists simply of a hole about 3' in diameter and 5' deep dug in the ground. When the catechu has remained in the trough for about twelve hours, it becomes of a thick jelly-like consistency and of a pinkish hue. It is then scraped out of the troughs and thrown into the centre vat, where it remains for two months or so. It is then taken out, spread on sand, and cut up into little bricks about $3' \times 2'' \times 1\frac{1}{2}''$. In this state it is of a dark brown colour, and is ready for market.

"The wood of *Bombax malabaricum* is used for making the wooden troughs, and the khairahas say that the catechu will not set, or will only set very slowly, in troughs made of other woods—*Odina Wodier*, etc.—which have been tried. They say, too, that it will not set in copper, brass or iron.

"Catechu is made during the cold months—December to March—and is prepared for the market in April and May. The Khairahas say that it cannot be made in the rains, as it will not set.

"The present amount of *Acacia Catechu* available for the manufacture of catechu is small, the forests having been over-worked, and rest and protection for a considerable period are necessary."

The Government of India have recently suggested that, as the once-flourishing industry of kath manufacture in Oudh seems in danger of becoming extinct in consequence of the gradual extermination of the khair tree by annual savannah fires, it is advisable that—with a view to the eventual revival of the industry—the possibility of reserving one or two compact blocks (at least 12,000 to 15,000 acres) of khair forest in the Kumaon terai, and of arranging for their strict protection against fire and grazing, be considered.

ADULTERATION.

The following information as to the more important adulterants of cutch used in Burma is derived from a note by Mr. Branthwaite of the Forest Department* :—

The adulterants most generally used are decoctions of the bark or wood, as the case may be, of *than* (*Terminalia Oliveri*), *tauk-kyan* (*Terminalia tomentosa*), *lein* (*Terminalia blata*), *hpanzah* (*Terminalia Chebula*), and to a lesser extent of *pyingado* (*Xylo dolabriforme*) and *pyinma* (*Lagerstrœmia Flos Regina*).†

1. *Than*.—The bark of the *than* tree, after being chopped up fine, is boiled in water in earthenware pots until all the essences are extracted from the bark. The liquid thus obtained is boiled with the essences similarly obtained from the chopped up wood of the cutch. Cutch thus adulterated can be detected as follows. If only a little *than* is used, little or no harm is done, but the resulting cutch is of a slightly brighter colour and more metallic. If large quantities, however, of the *than* be used, the cutch cakes break with a peculiar metallic fracture, are less bitter in taste, and have a slightly different smell. When largely adulterated with *than*, cutch loses its good properties, goods dyed with it lose their colour when washed, and, owing to the absence of tannin leather tanned with cutch thus adulterated is of little value.

In the Report of the Chemical Examiner, Rangoon, 1888, *than* is described as being "a red-coloured gum or mixture of gums, insoluble in spirit and having no action on polarized light. Under some circumstances it ferments and evolves gases. It contains no leather-forming property, but is thrown down by gelatine and alum. If, however, this precipitate is boiled in water, the *than* is dissolved." Some specimens prepared for the Imperial Institute fermented, and burst the bottle containing them.

2. *Tauk-kyan*.—Both the bark and wood of this species are used; if the former, the same process is followed as in adulteration with *than*; if the latter, the same method as in boiling cutch itself is followed. Adulteration with *tauk-kyan* can be detected by breaking the cutch cake, when the fracture, which is at first very bright, soon clouds over, losing its lustre. The smell is different, and the taste, instead of being very bitter, is mawkish. In addition to the above differences, the weight of the adulterated cutch is lighter. Owing to the absence or, at least, small amount of tannic acid in the bark and wood of *tauk-kyan*, goods dyed with this mixture soon lose their colour.

3. *Lein*.—The same process is followed when *lein* is used as an adulterant as in the case of *than*. The chopped up wood is not used.

If a stick is thrust into a soft cake, when it is drawn out the adulterated cutch will appear hanging on to the stick in long threads.

If a small quantity of lime be mixed with cutch adulterated with either *lein* or *tauk-kyan*, it turns almost liquid, but, if the lime be added to unadulterated cutch, it becomes hard.

* Indian Forester, 1892.

† Also ngabè (*Odina Wodieri*), Corbett.

4. *Hpangah*.—This was two or three years ago largely used in the Magwé district to adulterate cutch, but the way in which it is (or was) used was not known to Mr. Branthwaite.

In the note already quoted from (pp. 8-9) Mr. Corbett says, with respect to cutch adulteration, that "on ignition cutch should leave a residue of 3 or 4 per cent.; anything above this must be put down to adulteration. Sand, clay, and such like substances are frequently used as adulterants. Their presence may be easily detected by treating the cutch with ether, which dissolves out the catechin and tannic compounds, leaving, with pure cutch, a residue of 47 per cent. The residue in excess of this gives the amount of adulteration." Cutch should be completely soluble in boiling water; if soluble in cold water it may be suspected of impurities or of having been injured by heat.

There appears, according to Mr. Corbett, to be no doubt that adulteration is still carried on to a very considerable extent. At one time it was found that *than* extract was being extensively used for this purpose, and it was put a stop to, first by notifying *than* as a reserved tree, and afterwards by prohibiting the felling or lopping of *than* trees for the purpose of making *than sha* (cutch).

"It is said that Prome was formerly the centre of the cutch industry, but it is probable that now nearly all adulteration takes place in Rangoon, but this is uncertain. Chinese brokers, who have nearly all the trade in their hands, do not own to this adulteration, but they do own to re-melting soft cutch in Rangoon, mixing it with hard cutch, and packing in boxes bearing the mark of the firm. This is probably the time at which the adulteration takes place. It probably also takes place to a slight extent in the Meiktila and Myingyan Districts of Upper Burma. The Minbu and Magwé men say that it is still carried on in Prome with extracts brought from Myingyan in native boats. The Yamèthin men say that the adulteration takes place in Mohloing and Hlaingde; the Pyinmana brokers say that it is carried out in Yamèthin."

IMPROVEMENT OF MANUFACTURE.

In 1889 Dr. Warth started an enquiry into the reason why the makers of katha refused wood without spots, and only worked up that which was found to have the spots scattered all through the heart-wood. A preliminary examination showed that wood with spots yielded more extract than wood without. Dr. Warth was provided with small samples of woods and extracts made by the katha manufacturers in Oudh and by the cutch manufacturers in Burma.

The following samples of the wood were examined:—

Oudh No. I.—Reported by the *katha* makers as unfit for making *katha*. "One in a thousand of the large pores of the heart-wood filled with white substance."

Oudh No. II.—Reported as good for *katha*. About one in six of the large pores filled with white.

Burma A.—Reported by the Burmese as having no white spots. Has no spots, but cracks filled with white matter, (*keragi*).

Burma B.—Reported by the Burmese as having spots. One in twenty of the pores white.

Burma C.—Selected by the Forest Officer as having distinct spots. A very beautiful specimen with large white spots. About one in every three pores white.

The following table shows the amount of extract obtained at different trials. The extract was of such dryness that it just began to increase a little in weight on exposure to the air :—

Wood.	Per cent. Extract.	Maximum per cent.
Oudh No. I, . . .	6, 9, 10, 14, . . .	14
Oudh No. II, . . .	4, 15, 15, 16, 17, 19, 23, 24, . . .	24
Burma A, . . .	12, 15, 17, . . .	17
Burma B, . . .	14, 15, 16, . . .	16
Burma C, . . .	16, 16, 20, 20, . . .	20

The following table shows the amount of catechin separated out of the woods. Percentage of catechin in the extract :—

Wood.	Percentage of Catechin in the Extract.	Mean per cent.
Oudh No. I, . . .	33, 38, . . .	36
Oudh No. II, . . .	27, 31, 38, 64, . . .	40
Burma A, . . .	9, 19, . . .	14
Burma B, . . .	17, 46, . . .	31
Burma C, . . .	21, 36, . . .	28

From the above we calculate the total yield of catechin in these five woods as follows :—

Od No. I, . . .	5 per cent. catechin from the wood.
Oudh No. II, . . .	9 " " "
Burma A, . . .	2 " " "
Burma B, . . .	5 " " "
Burma C, . . .	6 " " "

Subsequently Dr. Warth obtained from Oudh a sample of wood No. 1, from which the local katha manufacturers said that they were unable to make katha. 37 per cent of dry-pressed catechin (the purest katha) and 12 per cent. of pure hard catechu tannin. He proposed the starting of a Government factory in the North-Western Provinces, in which catechin and tannin should be made by an improved method. This method was briefly to consist of cutting up the wood by machinery, boiling the wood and concentrating the liquid in copper vessels, the substitution of a filter press for the wasteful method of filtering through sand, and desiccation of the tannin solution, from which the catechin has been separated, in vacuum pans.*

The opinion of Forest Officers and others was taken with reference to Dr. Warth's scheme, and it was decided that it was not expedient to establish a Government factory, but that the attention of merchants and traders should be called to the experiments made by Dr. Warth with a view to improving the methods of manufacture. It was suggested by a Calcutta firm having large dealings in Burma cutch that this produce, as manufactured by the vacuum pan process, being quite free of catechin, would be much less valuable for dye purposes than the cutch prepared

* See Kew Bull., October—December 1890.

in the rougher manner, as in Burma and elsewhere, by which a large proportion of the catechin is retained in the cutch.

USES.

A.—DYE AND TAN.

For dyeing catechu has been in use in India from a very remote period. A solution of catechu is, by the action of lime or alum, changed into a dull red colour, which constitutes a fairly good dye, and is used for that purpose in some parts of India. The extract may be used, or the heart wood broken up and boiled with lime. With salts of copper and sal-ammoniac catechu gives a permanent bronze-brown, which is much used by the calico-printers of India. The colour is deepened by the use of perchloride of tin with the addition of nitrate of copper. In Dinajpur (Bengal) the red excretion from chewing *pán* is preserved and used as an auxiliary in dyeing eri (*Attacus ricini*) silk. Dr. McCann in his 'Dyes and Tans of Bengal' mentions a dye combination, and Mr. (now Sir) E. C. Buck, in his 'Dyes of the North-West Provinces,' adds several others, in most of which lime constitutes the metallic agent. The rationale of these dyes lies in the fact that, under the influence of oxidizing agents (chiefly metallic salts) the soluble catechu compounds are converted into insoluble and thus permanent dyes. By the calico-printers of Upper India 2½ of catechu are boiled in 3 gallons of water. To this solution is added 1½ of shell lime, and the mixture set aside for 12 hours. The surface coloured liquid is skimmed off and preserved as the printing "standard." In this case the oxidization has taken place, or nearly so, before the colour is printed on the fabric. In Europe this is never done; the dye-solution containing soluble catechin and gum is printed on the fabric, and the oxidization accomplished within the tissue. This is a much more effectual and permanent process.

Catechu has long been employed in India for tanning skins, but does not hold a very high position owing to the colour which it imparts to the skin. It is used for a low class of leather which, when made into boots, communicates to the stockings a yellow stain. The principal consumption of catechu occurs in the preparation of fibrous substances exposed to water, such as fishing-lines and nets, and for colouring stout canvas used for covering boxes and portmanteaux.

In the United States miners and working-men wear what are in India called khaki (dirt-coloured) clothes, dyed with catechu.

B.—MEDICINAL USES.

The medicinal properties of the resinous extract of *Acacia Catechu* are similar to those of pale catechu obtained from *Uncaria Gambier*, to which it is said to be preferred in the United States. The resinous extract is a powerful astringent, and may be administered either as a local application or in the form of infusion, tincture, or compound powder.

C.—OTHER USES.

The catechu sold in Calcutta under the name of telá is principally used for strengthening mortar used in the construction of brick buildings in and around Calcutta. It is also used for the manufacture of miniature gardens and other toys given as wedding presents. Native ladies take great pride in making such articles.

PROSPECTS OF THE CUTCH INDUSTRY IN BURMA.

The revenue derived from cutch in the unreserved forests of Upper Burma during the four years 1887-88 to 1890-91 is shown by the following table:—

YEAR.	DIVISIONS.							TOTAL.
	Chindwin.	Katha	Mandalay.	Minbu.	Mu.	Pyinmana.	Yaw.	
	<i>R</i>	<i>R</i>	<i>R</i>	<i>R</i>	<i>R</i>	<i>R</i>	<i>R</i>	<i>R</i>
1887-88 .	30	...	..	12,107		•	...	12,137
1888-89 .	280	530	1,240	22,100	2,097	10,430	9,640	46,317
1889-90 .	280	460	1,140	23,280	1,940	13,560	10,140	50,800
1890-91 .	120	1,260	2,320	28,745	6,360	23,120	18,480	80,405

In the Forest Report for Upper Burma, 1890-91, it is stated that "in some parts the cutch has been entirely, or almost entirely, worked out. In others the tree is still plentiful. The question of the measures to be taken to protect cutch in Upper Burma received consideration during the year. The experience of Lower Burma has shown that cutch will be exterminated unless its extraction is carefully regulated. The most effective way of regulating extraction is no doubt to reserve cutch-bearing areas. But reservation is not always possible. It cannot be carried out in tracts where there is a considerable cutch-boiling population. To reserve cutch areas in these localities would be to deprive a large number of people of their means of livelihood. Accordingly, the policy which it has been decided to pursue is to reserve cutch areas which are as yet unworked or are not situated in populated tracts, and to carefully regulate the cutch industry in localities where reservation cannot be carried out. The object which has to be kept in view is to prevent the felling of undersized trees. The felling of undersized trees has always been forbidden by the rules, but difficulty has been experienced in enforcing the law because evidence can rarely be obtained to bring home cases of illegal felling to particular individuals. In order to meet this difficulty it has been decided to insist on the joint responsibility of cutch-boilers for the felling of undersized trees. Cutch-boiling is carried on in small camps of a few workers, who fell trees in the immediate vicinity and drag them to the camp. It has now been made a condition of all licenses that, if an undersized tree is found in

a catch camp, all the licenses held in that camp shall be liable to be cancelled under the orders of the Divisional Forest Officer. It has further been directed that in future licenses shall be issued by Divisional Forest Officers only, and that large numbers of licenses shall not be given to single speculators. Henceforth licenses will be issued to actual workers only. It is hoped that the effect of the measures stated above will be to prevent the felling of undersized trees in Upper Burma."

The revenue derived from cutch in the unreserved Forests of Lower Burma during the ten years 1881 to 1891 is shown by the following table :—

DIVISIONS, LOWER BURMA.								
	Prome.	Tharrawaddy.	Toungoo.	Shwegyin.	Rangoon.	Western.	Thayetmyo.	TOTAL.
	R	R	R	R	R	R	R	R
1881-82	8,365	24,440	2,060	..	..	...	...	35,765
1882-83	22,726	24,220	2,020	..	...	...	...	48,966
1883-84	41,920	38,300	880	...	...	2,005	...	83,105
1884-85	47,920	33,040	558	1,000	100	1,254	...	83,872
1885-86	40,900	12,120	200	..	20	2,180	...	55,420
1886-87	97,740	12,280	180	..	160	1,120	...	111,480
1887-88	143,420	21,560	...	...	120	1,060	...	166,160
1888-89	93,950	16,060	1,820	..	...	2,400	..	114,230
1889-90	6,100	1,260	860	...	...	1,860	56,115	66,105
1890-91	4,660	2,760	600	140	...	2,620	25,930	36,710

The decline of revenue from R1,66,160 to R36,710 in four years must be regarded as a proof of the extent to which the supply of the tree has been exhausted, for the market value of cutch was maintained and even increased during that period. In the Review of the Forest Report for Lower Burma, 1890 to 1891, it is stated that "The Governor General in Council has read, with some concern, the remarks regarding the rapid disappearance of the *Acacia Catechu*, and not feeling satisfied that the step proposed of declaring it a reserved tree, of which, however, His Excellency in Council approves, will entirely meet the difficulties of the case, he considers it advisable that additional Reserves should be constituted in the cutch-growing areas of Burma. It is well known that reservation in these localities presents special difficulties; but, the question being one of great importance, the Government of India desire that the feasibility of such reservation should once more be fully considered."

TRADE RETURNS.

The following table shows the foreign trade in cutch exported from the Port of Rangoon during the year 1891-92 :—

	Quantity.	Value.
	Cwt.	R
To United Kingdom	86,872	1,442,300
„ Belgium	1,815	34,143
„ France	3,970	69,590
„ Germany	14,579	235,927
„ Holland	2,126	39,170
„ Italy	3,500	74,230
„ Spain	1,300	23,400
„ Egypt	8,884	134,794
„ Ceylon	1,218	25,789
„ China	5	75
„ Straits Settlements	9,410	140,252
TOTAL	133,679	2,219,690

In the 'Report on the Trade and Navigation of Burma,' 1891-92, the value of the exports of cutch during the last five years is stated to have been as follows :—

	R
1887-88	2,689,463
1888-89	3,077,974
1889-90	2,338,865
1890-91	1,413,354
1891-92	2,219,690

"The large increase," the report states, "in the exports of cutch during 1891-92 as compared with that immediately preceding it, was due to the excellent outturn of this product in the upper province and to a good demand having existed for the European markets. It was generally supposed that the trade in this article in 1891-92 would show a falling off on the previous year owing to the action taken by Government to protect the cutch-producing trees, and to allow trees only of a certain age to be used. But the expectation has not been realized for the reason that most of the boilers removed from Lower Burma, where the restrictions of Government were enforced, to Upper Burma where there was no lack of suitable material. Lower Burma on this account has

produced very little this year, while the supply from Upper Burma far exceeds that of any year on record. The following were the prices during the year :—

				Paungdè quality.	Soft.	Tablets.
Per 100 viss.				R a.	R a.	R a.
April,	1891	.	.	51 0	43 4	48 0
May,	"	.	.	...	46 4	51 12
June,	"	.	.	...	45 0	50 0
July,	"	.	.	...	44 0	50 0
August,	"	.	.	...	45 0	50 0
September,	"	.	.	...	45 0	50 0
October,	"	.	.	52 12	46 0	51 0
November,	"	.	.	61 12	48 0	53 0
December,	"	.	.	55 8	48 12	52 8
January, 1892		.	.	60 0	47 8	53 0
February	"	.	.	66 0	43 8	50 0
March	"	.	.	60 0	41 0	49 0

The following table shows the exports of Cutch (most, if not all, Burmese) from Bengal for the past five years :—

	1887-88.		1888-89.		1889-90.		1890-91.		1891-92.	
	Cwt.	R	Cwt.	R	Cwt.	R	Cwt.	R	Cwt.	R
To United Kingdom	1,751	34,400	12,026	1,79,779	2,184	34,611	6,882	91,775	10	184
" France	4,400	80,460	197	3,785	514	10,249	53	580	120	3,400
" United States	88,342	1,465,913	69,654	1,132,771	62,546	912,353	49,330	746,563	61,796	933,316
" Ceylon	449	7,240	80	1,225	40	650	31	701	0	144
" Other countries	3,288	50,463	47	986	463	9,214	3,869	47,500	61	1,555
TOTAL	98,300	1,644,483	81,914	1,318,546	65,749	967,077	58,963	887,119	61,993	937,899

In the 'Report of Sea-borne Trade and Navigation, Bengal,' 1891-92, it is stated that "the exports of *cutch* and *gambier* advanced during the past year, in comparison with 1890-91, by 5 per cent., but the figures are still below those of previous years.

"Exports to the United Kingdom fell to almost nothing. It cannot be expected that shipments to that country from Calcutta will ever be as large as formerly, since they are now made direct from Burma.

"The United States is the only country receiving *cutch* and *gambier* in any quantity from Calcutta, the increase in the past year nearly being 25½ per cent. The previous year was one of small exports, which has naturally been followed by larger shipments, though they were not up to the average of former years. As explained in previous reports, this is merely a transit trade, the *cutch* being sent to Calcutta for convenience of freight, as there is very little communication between Burma and the United States. There is no *gambier* exported, the whole of the shipments consisting of *cutch*."

Trade Returns.

21

The imports of cutch from Burma into Bengal during the past five years have been as follows :—

To	1887-88.	1888-89.	1889-90.	1890-91.	1891-92.
	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.
Calcutta . .	115,651	91,300	56,199	68,923	95,970
Chittagong . .	533	435	343	273	224
TOTAL . .	116,184	91,735	56,542	64,196	96,194

The exports of cutch from Bombay by sea to foreign countries during the past five years have been as follows :—

COUNTRIES TO WHICH EXPORTED.	1887-88.		1888-89.		1889-90.		1890-91.		1891-92.	
	£	R	Cwt.	R	Cwt.	R	Cwt.	R	Cwt.	R
United Kingdom.	5	30	1,704	13,632	...	...	1,000	10,000	...	...
France . .	...	...	515	4,320	1,080	14,800	98	13,500	...	...
Germany . .	...	...	...	...	1,000	10,000	2,250	32,525	1,300	12,000
Italy . .	...	...	563	6,100	...	...	200	3,600	...	...
E. C. of Africa .	...	7	6	202	1	40	11	290	1	54
Natal . .	2	81	...	...	...	...	...	...	...	...
Aden . .	4	240	6	308	14	795	19	1,118	11	635
Arabia . .	4	122	3	170	6	220	5	180	4	180
Maldives . .	...	...	...	...	2	80	...	...	...	...
Persia . .	4	107	...	...	2	127	...	...	3	125
Turkey in Asia .	1	30	1	25	3	110	2	100	4	122
TOTAL . .	20	637	2,798	24,757	2,108	26,162	4,474	61,407	1,323	14,206

The total exports of cutch from all India during the year 1891-92 are shown by the following table :—

COUNTRY TO WHICH EXPORTED.	QUANTITY.	VALUE.
	Cwt.	R
United Kingdom	86,882	1,442,484
United States	61,766	933,316
Germany	15,879	248,927
Straits Settlements	9,410	140,252
Egypt	8,884	134,794
France	4,090	71,990
Italy	3,507	74,430
Belgium	1,815	34,143
Spain	1,300	23,400
Ceylon	1,283	87,319
Other countries	82	2,730
TOTAL	197,059	3,172,961

The following quotations of the price of cutch in the London market are taken from S. Figgis & Co.'s Fortnightly Price Current:—

Cutch, fair to fine dry, April to 8th September, 1892 . 24/ to 34/
 " " " 22nd September to 15th December 20/ to 32/

The following recent market reports are taken from 'Capital,' a Calcutta commercial publication:—

CUTCH.

There has been a sale of 2,000 bags S.M. in diamond, at about R11, which appears to have satisfied the demand for the present; seller, however, is not offering any further lot. (November 2nd, 1892.)

Sellers have at last given a quotation, without however attracting any counter offer from America. S.M. in diamond may be quoted at R12-4 to 12-8 seller. (December 14th, 1892.)

Has been in better demand with buyers for S.M. in diamond at R11-2. The seller has been holding for R11-6, but an offer from buyers at R11-4 would lead to business. (January 18th, 1893.)

EDGAR THURSTON,

*Offg. Reporter on Economic Products
to the Government of India.*

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L A C.

Mr. J. S. Gamble recently sent me samples of three qualities of lac from the forests of Eastern Saharaspur, Siwaliks, with a view to their values in the market being obtained.

The samples were submitted to Messrs. Jardine, Skinner & Co., Calcutta, to whose Manager at Mirzapore I am indebted for the following report (January, 1893) :—

"Sample No. 1 appears to be seed-lac from fairly good new Bysakee stick-lac, but it has been ground somewhat too fine, and has not been thoroughly washed, as there is still a good deal of the colouring matter remaining in the particles. I should be glad to have a maund or a maund and a half of this to convert into shellac, when I should be in a position to put a price on it. No proper test can be made without making shellac from the above quantity. In any case, however, I should be prepared to give Rs25 a maund for it in the present state of the shellac market.

"Samples Nos. 2 and 3 appear to be from Bysakee or mixed Bysakee and Kutkee stick-lac. No. 2 seems to have been partly washed. No. 3 not. They both partake of the quality of one of our by-products, viz., Molomma, and I cannot say whether they would fetch more than Rs10 or Rs12 as Molomma in the bazar here. They are what natives like for mixing with fairly good seed-lac for making the T. N. mark, and they might fetch the price mentioned for this purpose; but they are of no use to us for any of our present marks. I should imagine from their appearance that the stick-lac from which they were taken was either somewhat old or else partly blocked."

Mr. Gamble writes that he has sent one maund of lac to be experimented with, that he can collect a large quantity of it, and that his ranger is "planting" it on trees. Some good sealing wax has been made from the lac and resin combined.

INDIAN WOODS FOR TEA-BOXES.

The following report by the Bombay-Burma Trading Corporation on didu (*Bombax insignis*) timber sent by the Conservator of Forests, Pegu Circle, is published in continuation of the note on this subject which has already appeared in the appendix series (November 1892) :—

"Three of the 22 logs received have now been converted with the following results :—

No.	Girth.	Length.	Round.		Measurement.		Box material.	
			Tons.	Ft.	Ina.	Ft.	Tons	Ina.
No. 1.	8'	0" 20'	0	45	0	0	0 24	0 10
" 2.	4'	8" 22'	0	29	11	4	0 11	11 0
" 3.	5'	2" 21'	0	35	0	5	nil.	

"Logs Nos. 1 and 2 turned out very well, the timber being sound close up to the heart, and there was no great waste except in sawdust. Log No. 3 (possibly not didu) appeared to be equally sound on the outside, but on being converted it proved to be riddled with worm holes throughout its entire length, and scarcely a single sound board was obtained from this log. The timber on first being converted has a strong disagreeable smell, but this quickly disappears with the sap when the boards are piled with spaces between them so as to allow the air to circulate freely. A good number of the boards are now found to be slightly warped, but this is owing to their having been exposed to the cold winds which have prevailed of late, and even teak boards would probably scarcely have fared better under these circumstances.

"At the time of sawing, the logs were found to be very sappy, but the sap quickly evaporates when the boards are exposed to the air. A board measuring $18'' \times 9\frac{1}{2}'' \times \frac{1}{2}''$ weighed 3lb 11 oz. on the 16th December last, the same day that it was cut. The same board to-day (18th January) weighs 1lb 13 oz., showing that it has lost nearly 50% of its sap in 34 days, and it is now quite sweet and apparently well seasoned. In appearance the converted timber is not unlike ordinary white deal, and should proper care be taken in seasoning it, it would possibly prove a suitable wood for tea-boxes, packing cases, etc.

"Should the timber be floated into Rangoon, care would have to be taken to avoid allowing the logs to remain for any length of time in the water, or there would be numerous cases similar to log No. 3, where the logs would be utterly worthless.

"We are sending some complete sample boxes to all the Indian tea-exporting ports with a view to obtaining the opinion of consumers on the suitability of the wood."

GUMS OF *PRUNUS COMMUNIS* AND *PRUNUS PUDDUM*.

In 1890 the Secretary of State asked that the Kew Museum might be supplied with samples of what is known as Persian (Khordofan) gum. Mr. Thiselton Dyer stated that commercial attention had been drawn to the Persian gum exported from Bushire, and believed to find its way into commerce as Khordofan gum, and suggested that it might be the produce of *Prunus bokharensis*, Royle (= *P. communis*, the common Plum or Alucha), or of *Prunus puddum*, Roxb. (the wild Cherry of the Himá-laya).

The question was referred to Dr. G. Watt, who stated that "*P. puddum* is the so-called wild cherry from which the cherry brandy of Simla is made. The dry plums that come from Bokhara were the cause of Royle giving the name *P. bokharensis*, but whether the tree from which they are collected is specifically distinct from the ordinary Simla Plum (*P. communis*) no one knows. I understand, however, that Mr. Parsons of the Annandale Gardens, Simla, got the dry plums of Bokhara and sowed the seed. These have grown into trees at Annandale, and on two occasions I asked Mr. Parsons to dry for me plants showing flower and fruit, to see if they differed from the ordinary plum which is common all about Simla, but never as a naturalised tree. There are two forms:—(a) one with small flowers, which I suspect may prove to be *P. bokharensis*, and of which there is a tree growing in the plot of ground opposite the Simla kacheri; (b) a large flowered form, common on the righthand side of the road to the U. S. Club, which is the common fruit-bearing plum sold in Simla from April to June."

The following reports have been submitted by the Deputy Conservator of Forests, Simla Hill Tracts Division, and Deputy Conservator of Forests, Amballa Division:—

"I have the honour to advise the despatch of the following gums:—

<i>Prunus communis</i>	:	:	:	:	:	:	9	oz.
" <i>puddum</i>	:	:	:	:	:	:	11½	"

"It appears that gum exudes from these species during the rains, and that collected from *P. communis* is from the large-flowered form."

1st February, 1892.

Deputy Conservator of Forests,

Simla Hill Tracts.

"Mr. Parsons informs me that all the plum trees at present in the Annandale Gardens were in existence before he came to Simla. They, however, are not indigenous, and were in all probability raised from seed, although it is now impossible to discover where this seed was obtained from.

"Of these Annandale plum trees there appear to be two kinds, which are respectively known locally as *Alu-bokhāra* and *Alūcha*.* Both these trees exude gums, but it is not possible to collect good specimens at present, as I find that the very heavy rainfall of the wet season, when the gum is said to be exuded, more or less washes away the gum, and renders any that may remain on the tree unfit for specimens."

G. S. HART,

Offg. Dy. Conservator of Forests, Amballa Divn.

RHEA (RAMIE) FIBRE.

(*Bœhmeria Nivea*.)

I have received a prospectus of the Indian Husbandry Company, Limited, which has secured 200 acres of suitable land about 90 minutes' journey by rail from Calcutta, and is in treaty for about 800 acres of land close to the above.

The object of the Company is to grow and manufacture rhea, flax, jute, hemp and other products on a commercial scale.

"Rhea," it is stated in the prospectus, "is an indigenous perennial plant propagated by roots, cuttings or suckers, and yields, in some places, five crops in a year. Its fibre is placed in a pre-eminent position by its inherent physical properties: fineness, length, lustre, strength, lightness, durability and resistance to water, which favour its application to various textile fabrics. It is already being converted in Europe into imitation-silk fabrics, handkerchiefs, neckerchiefs, ladies' scarves, umbrella and parasol covers, waistcloth, etc., etc. It stands a strong rival to the finest varieties of flax, and in canvas and sail-cloth its superiority over flax is undoubted. It admits of advantageous admixture with wool as well as with silk, and the 'noile' or the waste of the fibre, when out into lengths of 2 inches and mixed with cotton in the willow machine, render the yarn stronger and shining."

Mr. J. Cameron, Superintendent, Botanical Gardens, Bangalore, writes to me that he has been selling Rhea roots at a nominal charge of ₹25 per 1,000, and that he still has several thousand in stock and could easily increase the nursery stock enormously.

In the 'Kew Bulletin,' October, 1892, it is stated that "what little interest is at present being taken in extracting Ramie fibre from *Bœhmeria nivea* appears to be centred at Belfast."

According to 'Indian Textile Industries,' November, 1892, "the Bank of France will have their new issue of notes printed on paper made from it."

* In the Dictionary of Economic Products the names *Alu-bokhāra* (yellow) and *Alūcha* (yellow) are given for the fruit of *F. communis*.

SILK-COTTON TREE.

In an article entitled "*Un nouveau service forestier sous les tropiques*," contributed to the *Revue des Eaux et Forêts*, 10th December 1892, M. A. Chavegrin writes from Réunion as follows:—

"I plant out in some moist localities the wool-giving tree, *Bombax malabaricum*. The timber of this species is valueless, but the fruit capsules, which the tree produces from the age of five years onwards, contain a valuable down, for which as much as five francs per kilo is given. In certain years, when there have been no violent gusts of wind, the tree at ten years of age can yield as much as ten kilogs of woolly stuff, but this figure is a maximum which is very rarely reached."

In the British Trade Journal, 1st January 1893, it is stated that "the export in kapok (*Bombax* or *Eriodendron*?) in Ceylon is of very recent origin, and that, since an export trade has begun, the demand has increased so much that not only is kapok carefully collected from the trees growing wild, but great care is taken to preserve it, and plant new trees wherever the opportunity occurs. There is a large demand for the article in Australia, where it is used in the manufacture of pillows and cushions; and it is also exported to Holland and Fiji, where it is said to be used for the manufacture of cloth."

BLACKWOOD OR ROSEWOOD.

(*Dalbergia Latifolia*.)

For the following note I am indebted to Mr. J. S. Gamble:—

"The rate (£18-10 per ton) quoted in the 'Manual of Indian Timbers' was for an exceptionally fine large piece of handsome grain. But I believe that good Mysore or Wynnad Blackwood would fetch £8 to £10 per ton any day if sent in regular supplies in good squares of sound wood and carefully seasoned.

"I used to be very sore at having to sell my Mudumalai and Benné Blackwood at 4-6 annas a cubic foot in the forest, knowing its value in Europe; and I contemplated arranging for departmental transport to the coast at Calicut or Tellicherry, cart to the Nilambur river down the Karkoor ghât, or through Vayitri and then floating. The timber on the western ghâts runs big. I have seen logs of 2 feet square (4 square feet) on the section and 20 feet long, and pieces in squares of 18 inches side are not uncommon.

"In these days of low exchange, the trade in Rosewood (as they must call it to make the dealers understand) ought to pay well, and I should not be surprised if the Australian market were even better than the English. It is just the question of the fashion. At one time I can remember Rosewood veneered furniture was the correct thing; then at another it was 'Mahogany'; at another 'Bird's-eye Maple.' Then came in the American 'Black Walnut.' Now I suppose 'Padank,' and possibly *Albissia* or 'East Indian Walnut,' will have a run, but the fashion may easily go back to Rosewood. The pieces used need not always be very large. Clearly large logs of ordinary wood have the best sale, but good small logs of pretty figure would possibly be better, and then the handsome Rosewood of the Circars and North Bengal might pay to export. Foster at page 301 of 'Indian Forester,' July number, says there is just now a heavy demand at about 12 annas per cubic foot in Coorg, but he does not say where it goes to."

The following extracts are taken from Churchill and Sim's Circular, 1892:—

ROSEWOOD, EAST INDIA.

January 1st.—Good logs are now in demand, and moderate imports would sell well.

February 3rd.—Good wood is asked for, and large, sound logs would sell well, as the only stock consists of small and poor wood.
£7 to £11.

March 3rd.—Large, good logs are asked for, and, if shipped in moderate quantities, would sell well.
£7 to £11.

April 4th.—For good logs of large sizes satisfactory prices are obtainable, but to maintain present figures imports must not be too heavy.
£7 to £11.

June 4th.—A fair demand, although prices are a little easier.
£7 to £11.

September 5th.—The demand remains very quiet, and sales low, the tendency of prices being rather easier.
£7 to £10.

November 5th.—Sales are not easily effected, as there is no activity in the demand; therefore stocks, although not excessive, are quite sufficient.
£5 to £9.

December 7th.—Some small sales have been effected at rather easier prices.
£5 to £9.

INDIAN MUSEUM,
Calcutta.

EDGAR THURSTON.

Note on the Sea-borne Export Trade in Timber from Tenasserim.

TENASSERIM was ceded to the British in 1826, but, as noted in the British Burma Gazetteer, Burma had long before that year been a great timber-exporting country. The bulk of the timber in former days used to be exported from the port of Moulmein, and "Moulmein Teak" was well known and appreciated for its good qualities, so that for many years all Teak exported from Burma went under that name.

The Customs Office in Moulmein was first organized in the year 1855, so that previous to that year no figures of the actual export of timber are obtainable.

The accompanying tables contain all the available figures of the export trade in timber from the year 1855-56 to the year 1891-92. It will be convenient to divide the export trade under two heads:—

- (1) The sea-borne export trade in Teak.
- (2) The sea-borne export trade in all other kinds of timber.

Of the Teak timber exported from Moulmein previous to the year 1855, it is more than probable that a large proportion was obtained from the forests in British territory, and especially from the valleys of the Ataran, the Salween, and its tributaries, the Yemzalin and Dondami. But as the forests here, more particularly those in the Ataran, were ruthlessly worked and denuded under leases issued to private individuals, the supply soon began to fall off, and timber traders had to go further inland to the Thaungyin valley, to Karrenni, and the Shan States. The actual imports of foreign timber, so far as can be ascertained, commenced on or about the year 1843; but the import figures in the Kado Depôt records extend back only as far as the year 1859-60, in which year the import of foreign Teak is shown to be considerable, and it has been maintained since.

From the table (Annexure A) it will be seen that the export of Teak to the United Kingdom, and, in fact, to all foreign ports, varies more or less from year to year. There has never been a steady increase or a steady decrease.

Leaving out the last two years, the export to the United Kingdom was highest in the year 1864-1865, when 53,039 tons were exported, and lowest in 1886-87, when it fell to 8,531 tons.

In the years 1890-91 and 1891-92 the decrease in the amount exported was remarkable, coming to only 6,451 tons in 1890-91 and 6,831 tons in 1891-92, as against 23,555 tons in 1889-90.

To Indian ports the export of Teak rose from 8,191 tons in 1855-56 to 30,229 in 1857-58.

From that year, like the exports to the United Kingdom, the amount exported has varied from year to year, the highest export being 95,997 tons in 1887-88.

During the last three years the trade has been fairly steady.

The export trade to Egypt, Port Said, and Cape Colony up to the year 1878-79 was very desultory. Since the latter year an amount, which, however, varies considerably, has been steadily exported.

Records exist of only two small exports to Australian and American ports.

The exports to provincial ports have never reached any very high figure. The largest amount, 6,080 tons, was exported in the year 1887-88.

Annexure D shows the prices obtained for articles manufactured from Teak, of which there has been an export since the year 1866-67.

The present state and future prospects of the Teak trade of Moulmein are not hopeful.

Of late years, and especially during the last two or three, there has been not only a considerable falling off in the exports, but a great lack in such exports of timber of good length and girth.

The reasons for the decrease in, and of the inferiority of, exports are, briefly, the competition of Bangkok and Rangoon, which has acted most unfavourably on the exports from Moulmein, the forests in British territory being fearfully overworked, and the timber now drawn from them being most inferior in quality, while it is to be feared that the imports of foreign Teak will begin to fail at no distant date.

Already within the last eight years the imports of full-sized Teak logs has fallen off from 1,41,774 in 1884-85 to 54,375 in 1891-92.

Timber importers also complain that the extraction of Teak in foreign territory becomes more expensive year by year by reason of the forests in the vicinity of floating streams being utterly exhausted and timber of any value being now found only at great distances from such streams, entailing often a two-years' drag.

The figures of the export of the sea-borne trade of woods other than Teak have been traced back to as far as 1866-67. What kinds of wood were exported between the years 1866 and 1872 is not known, no record beyond the mere figures of the export existing.

In 1872-73 Padauk (*Pterocarpus indicus*) and Pyinma (*Lagerstramia Flos-reginae*) were exported.

In 1873-74, the exports were 1,380 tons of Thitka (*Pentace burmanica*) and Thitkado (*Cedrela Toona*), 88 tons of Pyinma, 50 tons of Padauk, and 50 tons of Thingan (*Hopsea odorata*).

In 1874-75 616 tons of Thitka and Thitkado and 576 tons of Padauk, Ingyin (*Shorea siamensis*), Pyinkado (*Xylia dolabriformis*), and other woods made up the exports.

Of the exports from 1875 to 1882, Padauk timber formed a notable portion. In those years the exports of this timber were as follows:—

	Tons.
1875-76	145
1876-77	142
1877-78	183
1878-79	77
1879-80	169
1880-81	153
1881-82	268

The balance of the exports was made up by woods of other kinds, but there are no records to show what these woods were.

In 1882-83 the exports consisted of 156 tons of Pyinma, 81 tons of Padauk, and 26 tons of Ingyin, the balance consisting of Pyinkado and woods for tea boxes.

In 1883-84 the exports were 249 tons of Padauk, and the balance of Pyinkado and woods for tea boxes.

In 1884-85, 141 tons of Padauk were exported, while Thitka and other woods for tea boxes amounted to 3,618 tons.

In 1885-86 the exports were 15 tons of Ingyin and about 400 tons of Padauk. There was also some selected Thitka shipped to the Home market as an experimental consignment. The demands for woods for tea boxes fell off owing to the low prices at which second-class teak was obtainable.

In 1886-87 about 200 tons of Padauk were exported, and the demand for woods for tea boxes improved towards the end of the year, the Moulmein tea boxes being considered superior to the Assam ones.

In 1887-88, 189 tons of Padauk were exported, and Kanyin having been accepted in lieu of Thitka, Pyinma, and Thitya (*Shorea obtusa*), for the manufacture of tea boxes, the demand for these continue to increase.

In 1888-89, 190 tons of Padauk were exported, with about 32 tons of Ingyin.

In 1889-90 the exports of Padauk were 160 tons.

In 1890-91, 87 tons of Padauk were shipped, while the remainder of the exports for the last two years were mostly Kanyin (*Dipterocarpus*) and Pyinma. The demand for Moulmein tea boxes, owing to those shipped from Japan being preferred on account of their cheapness, showed a decided falling off.

From Mergui the exports from the year 1866-67 to 1876-77 were mostly Thingan timber. The shipments made after these years consisted chiefly of Pyinkado and some Gangaw (*Mesua ferrea*) sleepers.

The exports from Tavoy were nearly all Pyinkado sleepers and scantlings, and a small quantity of Thitka. During the last few years the trade in these has shown a marked increase.

The exports of boat-hulls have been traced from 1885-86 onwards.

The export trades in woods other than Teak to the United Kingdom, to Egypt, and to European ports has never been of any extent; in fact, the export being rarely other than experimental consignments.

To Indian ports it increased steadily up to the year 1883-84, after which there was a marked decline. During the last three years, however, the demand seems to be increasing.

To provincial ports there has been a small export since the year 1877-78, the exports for the year 1891-92 in these woods showing a marked increase on previous years.

The present prospect of the trade in woods other than Teak is encouraging. Owing to many new lines of railway being started in India, the demand for sleepers has increased considerably. The bulk of these has hitherto consisted of Pyinkado, but owing to the keen competition among traders and the difficulty experienced in the conversion of Pyinkado (one of the hardest woods in the forests), a vast number of sleepers of other woods during the last two years have been shipped to

the Indian market. Among the woods tried have been two, Kanyin and Ingyin, which are certainly unsuitable to the purpose, and efforts have been made to introduce Pyinma, a far superior wood for sleepers.

Under the orders of the Chief Commissioner of Burma, the State Railways in Burma have taken over a consignment of sleepers of this wood for trial, and quite lately shipments of the same have been made by various timber-dealers to India. Pyinma, it may be noted, is superior to Pyinkado in that it is more easily worked and has more lasting powers, especially in damp situations. As a material for house-building, Pyinma is as good almost as Teak, and efforts are being made to introduce the wood for that purpose also.

It is to be noted that the supply of all these woods, with the exception of Ingyin and of Pyinma, so far as the Tenasserim Forest Circle is concerned, is limited, and should the demands for them increase much, under the existing system of extraction under licenses, the forests will be more or less depleted of these woods.

MOULMEIN.

C. T. BINGHAM, *Major,*
Conservator of Forests,
Tenasserim Circle.

Sea-borne trade in Teak Timber from Moulmein.

YEARS.	UNITED KINGDOM.		CONTINENTAL PORTS.		INDIAN PORTS.		EGYPT, PORT SAID, AND CAPS COLONY.		AUSTRALIAN AND AMERICAN PORTS.		PROVINCIAL PORTS.		REMARKS.
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	
1852-53	18,585	9,45,745	10	550	8,191	4,00,000	377	19,864	1,684	81,237	Under "Indian Ports" are included all Asiatic Ports except Provincial Ports.
1853-54	30,981	15,14,008	...	...	10,279	5,03,123	...	...	...	...	1,068	53,347
1854-55	36,773	16,95,078	...	...	30,239	11,40,978	654	28,432	...	...	1,716	74,663
1855-56	36,039	17,19,013	...	...	40,236	18,20,213	...	...	...	...	898	33,633
1856-57	34,007	17,49,030	243	52,400	24,497	12,52,248	...	...	...	...	758	37,003
1857-58	33,545	18,42,355	...	...	26,598	15,53,498	...	...	...	...	1,350	38,515
1858-59	54,670	24,02,417	300	32,400	40,798	18,59,877	...	...	...	...	1,633	70,703
1859-60	53,187	26,31,029	983	66,975	40,778	21,78,634	...	...	...	...	7164	34,385
1860-61	55,884	26,40,714	307	20,338	43,188	22,61,823	...	...	...	...	3,649	2,07,893
1861-62	53,894	24,34,319	764	49,710	56,310	31,45,461	...	...	...	...	2,112	1,25,350
1862-63	59,430	26,17,363	330	23,408	78,139	43,26,954	...	...	...	...	1,860	92,972
1863-64	14,194	6,17,594	909	53,059	33,967	19,78,017	...	...	...	...	849	32,492
1864-65	12,034	6,11,400	977	68,397	45,649	21,33,635	...	...	...	...	1,061	55,935
1865-66	34,078	16,07,778	1,035	58,775	60,020	32,36,773	...	...	...	...	1,006	65,038
1866-67	18,316	8,98,166	1,084	1,36,199	57,716	28,70,772	...	...	...	...	349	18,437
1867-68	31,487	17,70,433	2,235	1,61,593	52,460	17,64,785	...	...	...	...	1,017	59,879
1868-69	31,487	17,70,433	35	2,450	45,008	26,06,461	...	...	...	...	965	48,476
1869-70	31,487	17,70,433	979	77,436	61,031	31,40,690	...	...	...	...	1,719	83,445
1870-71	31,487	17,70,433	1,019	46,966	51,073	23,96,839	...	...	...	...	2,818	1,29,017
1871-72	30,113	19,12,679	109	16,928	45,699	23,96,839	...	...	...	...	4,780	2,33,088
1872-73	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	3,834	1,98,644
1873-74	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1874-75	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1875-76	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1876-77	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1877-78	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1878-79	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1879-80	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1880-81	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1881-82	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1882-83	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1883-84	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1884-85	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1885-86	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1886-87	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1887-88	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1888-89	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1889-90	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1890-91	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1891-92	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1892-93	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1893-94	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1894-95	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1895-96	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1896-97	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1897-98	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1898-99	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1899-00	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1900-01	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1901-02	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1902-03	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1903-04	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1904-05	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1905-06	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1906-07	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1907-08	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1908-09	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1909-10	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1910-11	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1911-12	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1912-13	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1913-14	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1914-15	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1915-16	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1916-17	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1917-18	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1918-19	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1919-20	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1920-21	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1921-22	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1922-23	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1923-24	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1924-25	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1925-26	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1926-27	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1927-28	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1928-29	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1929-30	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1930-31	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1931-32	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1932-33	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1933-34	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1934-35	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1935-36	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1936-37	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1937-38	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1938-39	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1939-40	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1940-41	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1941-42	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1942-43	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1943-44	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1944-45	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1945-46	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1946-47	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1947-48	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1948-49	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1949-50	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	1,54,948
1950-51	31,487	17,70,433	...	...	51,073	23,96,839	...	...	...	...	2,800	

Sea-borne trade in woods other than Teak from Moulmein.

YEAR.	UNITED KINGDOM.		EUROPEAN PORTS.		INDIAN PORTS.		EGYPT-POMT SAID.		PROVINCIAL PORTS.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
		£		£		£		£		£
1866-67	...	...	...	...	303	20,150	...	...	...	...
1867-68	...	...	...	...	413	47,487	...	...	...	...
1869-70	...	...	...	...	24	770	...	...	...	...
1870-71	...	...	...	...	783	18,890	...	...	...	...
1872-73	...	...	...	...	590	23,800	...	...	...	...
1873-74	...	...	1,105	49,424	203	9,210	...	...	...	...
1874-75	...	...	14	619	1,010	53,675	...	...	...	...
1875-76	...	...	...	...	145	9,761	...	...	...	...
1876-77	...	...	...	...	...	...	...	...	...	...
1877-78	...	...	25	...	241	...	...	...	62	...
1878-79	31	1,115	18	...	144	4,650	...	...	127	4,399
1879-80	53	1,865	1	15	800	46,781	128	5,685	223	7,353
1880-81	5	220	...	...	1,243	37,833	...	...	515	25,619
1881-82	3	140	...	...	1,477	94,610	...	...	1,720	66,959
1882-83	11	600	...	...	3,108	1,86,324	...	...	1,805	65,353
1883-84	6	220	...	...	4,284	2,47,075	...	...	2,017	68,241
1884-85	22	1,170	14	268	2,557	1,50,053	...	...	1,161	38,631
1885-86	...	...	...	...	2,777	1,76,283	...	...	434	14,674
1886-87	...	...	...	...	1,391	85,983	6	180	190	8,021
1887-88	...	...	...	...	827	46,416	...	...	400	14,508
1888-89	...	...	1	48	1,932	86,183	...	...	713	20,943
1889-90	56	2,717	...	...	4,309	2,09,780	...	...	1,391	66,089
1890-91	...	...	113	4,661	3,023	1,11,596	25	735	1,459	50,336
1891-92	42	1,677	...	...	4,420	1,92,177	137	6,568	2,060	78,080

Sleepers and Railway Keys from Moulmein.

YEAR.	SLEEPERS.		RAILWAY KEYS.			
	INDIAN PORTS.		INDIAN AND OTHER PORTS.		UNITED KINGDOM.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
		₹		₹		₹
1882-83 . . .	658	1,178	10,978	31,938	...	..
1883-84 . . .	...	...	7,090	18,847	...	..
1884-85 . . .	...	...	4,625	10,506	...	...
1885-86 . . .	...	...	10,528	26,142	...	..
1886-87 . . .	19,900	49,266	9,361	23,211	..	..
1887-88 . . .	1,041	5,780	8,554	15,845	1,127	1,691
1888-89 . . .	...	...	9,880	21,148	...	...
1889-90 . . .	6,791	17,330	7,078	16,758	...	...
1890-91 . . .	8,189	14,980	1,048	1,442	...	...
1891-92 . . .	31,790	84,557	2,142	7,172	...	...

Teak manufactures from Moulmein.

YEAR.	United Kingdom.	Continental Ports.	Egypt, etc.	Indian Ports.
1866-67 . . . .	...	...	...	2,134
1868-69 . . . .	...	...	...	4,444
1869-70 . . . .	...	...	...	5,615
1870-71 . . . .	...	...	...	1,090
1871-72 . . . .	...	...	...	2,612
1872-73 . . . .	...	...	...	6,878
1873-74 . . . .	...	...	...	792
1874-75 . . . .	...	...	...	808
1879-80 . . . .	...	...	...	...
1880-81 . . . .	...	...	...	...
1881-82 . . . .	...	...	...	109,877
1882-83 . . . .	...	...	...	121,437
1883-84	1,303	270	...	92,084
1884-85	903	180	1,169	117,107
1885-86 . . . .	...	...	1,871	71,606
1886-87	747	2,066	2,522	85,233
1887-88 . . . .	...	982	4,218	222,711
1888-89 . . . .	...	1,844	2,607	172,959
1889-90	340	186	992	165,069
1890-91	20	2,518	1,528	163,248
1891-92	1,308	5,771	156,161

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Tavoy and Mergui.

YEAR.	TAVOY.				MERGUI.	
	TIMBER.		BOAT-HULLS.		TIMBER.	
	Quantity.	Value.	No.	Value.	Quantity.	Value.
1866-67 . . .	...	...	...	...	9	261
1867-68 . . .	...	...	...	...	9	191
1868-69 . . .	...	...	...	...	16	444
1869-70 . . .	...	...	...	...	25	789
1870-71 . . .	...	...	...	...	...	...
1871-72 . . .	...	...	...	...	2	80
1872-73 . . .	...	...	...	...	168	2,386
1873-74 . . .	...	...	...	...	8	919
1874-75 . . .	...	...	...	...	56	1,427
1875-76 . . .	...	...	...	...	139	1,159
1876-77 . . .	71	4,000	...	...	7	400
1877-78 . . .	252	7,778	...	...	...	...
1878-79 . . .	352	20,000	...	...	53	2,900
1879-80 . . .	348	19,520	...	...	...	...
1880-81 . . .	381	21,209	...	...	...	...
1881-82 . . .	767	36,524	...	...	...	...
1882-83 . . .	726	26,540	...	...	...	...
1883-84 . . .	805	31,810	...	...	8	204
1884-85 . . .	97	22,070	...	...	...	...
1885-86 . . .	769	36,088	24	25,500	...	...
1886-87 . . .	1,144	46,223	39	34,125	41	100
1887-88 . . .	917	34,684	47	43,250	...	...
1888-89 . . .	229	6,955	61	61,500	...	...
1889-90 . . .	133	5,950	80	81,480	41	1,579
1890-91 . . .	595	23,031	107	1,10,750	...	...
1891-92 . . .	545	20,230	121	1,43,450	...	...

"EAST INDIAN WALNUT." (ALBIZZIA LEBBEK)

The object of this hand-book is to bring to prominent notice a timber which has been occasionally sent from the Andaman Islands to London, where it has commanded a ready sale. It has a beautifully patterned grain, and makes very pretty furniture.

The Siris tree (*Albizzia Lebbek*), whose timber is called "East Indian Walnut" in the English market, is a large, deciduous, spreading tree, belonging to the natural Order Leguminosæ, found wild or cultivated in most parts of India; growing in the evergreen forests in the Sub-Himalayan Tract from the Indus eastward, in Bengal, Central and Southern India, Burma, and the Andaman Islands, and ascending to 5,000 feet in altitude.

The following account of the wood is given by Gamble in his 'Manual of Indian Timbers':—"Sapwood large, white; heartwood dark brown, hard, shining, mottled with deeper coloured, longitudinal streaks. The annual rings in trees grown in the Panjáb are marked by a distinct line.

"Pores large, not numerous, often subdivided and enclosed in patches of softer whitish tissue, which are frequently arranged in short bands. Pores prominent on a longitudinal section. Medullary rays fine, very numerous."

The growth of the tree, which is said to attain a height of 40—60 feet with a girth of 6—8, and at times 10—12 feet, is exceedingly rapid during the first few years, and Brandis says, in his 'Forest Flora of North-West and Central India,' that trees in the Panjáb have 2½ feet girth in 12 years, 4½ feet in 30 years, and that trees at Sakhar in Sind 17 years old have reached 5 to 6 feet in girth. This, as pointed out by Gamble, would give from 1 to 3 rings per inch of radius, which is very fast.

The weight of the wood is said to be 40 to 60 lbs per cubic foot. It seasons, works, and polishes well, and is fairly durable. Its value may be inferred from the fact that the Burmese Government fixed a higher tax upon the felling of Kuk-ko (*Albizzia Lebbek*) than for Teak or any other tree.

The wood is used (in India) for picture-frames, sugarcane-crushers, oil-mills, furniture, well curbs, canoes (Burma), and wheel-work; in South India for boats. In the Andaman Islands, where trees of large size are procurable, it is utilised for building, and especially for house-posts. In the Deccan the wood is considered as being of excellent quality. In Northern India it is considered unlucky to employ it in house building. (*Drury, Romburgh, etc.*)

* The true Walnut of India is *Juglans regia*, which is very largely used on the Himalayas (e.g., at Simla) for ornamental carving; but, though some excellent planks have been exported to Europe from Kulu, Chamba, and Kashmir, the timber does not as a rule compare favourably with American Walnut.

The Deputy Conservator of Forests, Andaman Islands, in reply to a circular recently issued by Mr. Ribbentrop, Inspector General of Forests, stated that "small quantities of Koko timber have occasionally been sent to London with the Padauk², and have commanded a ready sale. It makes pretty furniture, having a beautifully patterned grain, and works up well when carved. Unfortunately we could not promise a continuous supply from the Andamans; otherwise, as the wood sells equally well with Padauk, we should have exported it regularly."

The London sales of the timber from the Andaman Islands in 1890-91, were 211 cubic feet or 4 tons.

Burrs of *Albizzia* ~~Lebbek~~, like those of any other furniture wood, increase in value with the intricacy and rarity of the design, and the size of the burr. The price of such burrs, which are invariably sliced up into veneer, is frequently ten to twenty times that of the plain wood, and as much as a hundred times the value of the ordinary wood has been paid for extremely curious and unique burrs.

The possibility of creating a regular export trade in "East Indian Walnut" from India appears to be well worthy of the consideration of the Forest Department as well as of Timber merchants in Europe and India.

Specimens of the timber have been sent to the Imperial Institute from the following localities:—

Andaman Islands.

Thayetmyo Division, Upper Burma.

Tenasserim (where the tree is reported to grow sporadically, and never to occur in large numbers)

Terai Forests, Darjeeling District, Bengal.

Satara District, Bombay.

Poona " "

Surat " "

West Khandesh " "

North Kanara " "

South Arcot District, Madras.

Bellary " "

Ganjam " "

Malabar " "

Arrangements have also been made for the preparation of some specimens of Indian carving in the timber for the Imperial Institute.

EDGAR THURSTON,

*Offg. Reporter on Economic Products
to the Government of India.*

² See 'Hand-book of Commercial Products,' No. 1.

Bhabar Grass, and the Trade in it.

This grass, the *Ischamum angustifolium*, Hackel, is an important and valuable paper-making material, similar to the "Esparto" grass of Spain and the "Alfa" of Algeria.

It is found only on poor soils in broken country in Central and Northern India, from the Godáviri up to the lower slopes of the Himalaya and the lower Himalayan valleys. It is especially common in the Siwalik hills, and extends from Afghanistan along the hills to the Ganges or beyond it to similar localities down through the Garhwal and Kumaon lower hills into Oudh, Nepal, and Sikkim, where it is scarce however.

In the Central Provinces it occurs on poor lands in broken country, and extends thence eastwards into Chota Nagpore and through the hill states into Orissa and the Circars, where it is chiefly found upon laterite and on the stiff clays of the poorer forests. It is doubtful if it is found far south of the Kistna river, but it extends eastwards through Burma into China.

Its botanical identification was for long uncertain. The fact that in some parts of India, and notably in the Siwaliks, it is found in localities where a species of sedge, the *Eriophorum comosum*, is also common, it was at first supposed to be that species, which however, it may be noted, is cut and used indiscriminately with the true Bhabar.

In the 'Bulletin of Miscellaneous Information', published at the Royal Gardens, Kew, for 1888, page 157, is published a full account of the subject, and it is there recorded that specimens of the true "bhabar" were in 1879 sent to England by Mr. J. F. Duthie, then Superintendent of the Government Botanical Gardens at Saharanpur. These, though imperfect, were identified by the late General Munro, C.B., F.R.S., then the greatest living British authority on grasses, as being the *Spodiopogon angustifolius* of Trinius (*species Graminum* t. 336). In 1883 it was discussed by Mr. W. T. Thiselton Dyer, F.R.S., under the name *Pollinia eriopoda*, Hance, in Volume XX of the Journal of the Linnean Society, page 409. In 1887-88 it was figured in plate 1773 of Volume VIII of Hooker's 'Icones Plantarum' with a description by Professor D. Oliver, who first published the name which Professor Hackel was about to give it, and under which it appears in his Monograph of the *Agrostideæ*—*Ischamum angustifolium*.

In 1882-83 Dr. G. King, Superintendent of the Royal Botanical Gardens, Calcutta, quoted in the Kew Bulletin, gave the following information in his annual report:—

"In several former reports I have referred to the leaves known by the vernacular name Bhabar as the produce of *Eriophorum comosum*. I have now satisfied myself that the bulk of the Bhabar used by natives for rope-making is not derived from *Eriophorum*, as I have supposed, but from *Andropogon iscolutus*. This grass I find from enquiry locally made abounds in the hill parts of Behar and Chota Nagpore, where it is known as Sabai. From these regions it can be obtained in quite considerable enough quantity to make its utilization as a paper

material a feasible project, and the people who actually collect it sell it at a reasonable enough rate. But in order to get it brought to Calcutta in sufficient quantity for local manufacture, or for shipment to Europe, middlemen have to be employed, whose ideas of profit are pitched so high that, until they become modified, the utilization of Bhabar must remain in abeyance. This is only in accord with the common experience in the moussil, that competition in trade is not sufficiently keen to have much effect in keeping down prices, but that, on the contrary, traders still form guilds banded together to enhance prices, even at the risk of choking off demand."

Again, in 1883, the late Mr. Thomas Routledge, the paper manufacturer of Sunderland, gave the Kew authorities the following as the result of his trials of the grass :—

"I believe it will make a fair sheet of paper, much the same as fine Esparto; in fact, in many respects, as a natural product, it closely resembles Esparto, but does not contain so much glutinous and amylaceous matters, nor so much silica. The sample sent, you will remark, was cut, and not pulled from the roots as Esparto is. Like Esparto, *in situ* it is worth very little, and is used for similar purposes—roping, matting, baskets, etc. The cost of Esparto consists in collection, carriage to port of shipment, and, latterly, baling charges, freight to England, etc. Whether from India, with long and probably costly inland carriage, with heavy freight added, it can come into competition with Esparto is doubtful, and I do not think it would pay to convert it into stock,"

The Manager of the Lucknow Paper Mills, Mr. C. E. Edwards, also wrote in 1883 to the Director of Agriculture in the North-Western Provinces and Oudh as follows :—

"This grass we have used here, but not to any great extent, owing to the price being too high; besides the outturn is not so great as with jute. I found it not to yield more than about 35 per cent of paper. This is to a great extent owing to the top part of the plant being somewhat perished; I presume owing to the tops being more exposed to the atmosphere, as this part appears to get ripe much earlier than the bottom. In the process of boiling the perished or top part gets destroyed before the bottom part of the stem gets sufficiently reduced to a pulp. This accounts for the great loss in the manufacture; but this could be obviated by having the top parts cut off before despatching it to the paper mills, and if it could be had at the same price with the tops off, I have no hesitation in saying it would be a good and cheap enough fibre for paper-making purposes."

At the suggestion of the Inspector General of Forests to the Government of India, in Circular No. 10 of 21st October 1891, a report on the subject of the trade in, and supply of, this valuable grass from his division was made by Mr. L. Mercer, Deputy Conservator of Forests of the Saharanpur Division, School Circle, North-Western Provinces and Oudh.

The following is Mr. Mercer's report :—

"This grass forms one of the most important products of the Saharanpur Forest Division. It is found only in the broken hilly ground of the Siwalik hills, not in the plains, grows principally in tufts, flowers in February and March, the seeds being obtainable in March and April. The system of export is as follows :—

"The different blocks of the forest are let out to contractors, who farm the produce. The contracts are given from the 1st October to the end of February. The grass itself is taken out by head-loads, the rate being nine pice per load, by dandy-load the rate being two annas three pice, by pony-load at three annas per pony, and per cart-load at twelve annas per two-bullock cart. The first is, however, the general method of export. The average weight of a head-load is about a maund, the weight of the other loads being in proportion to the rates charged. For a month or six weeks

after the contractors' leases have expired, tickets are given at the different forest chaukis at the abovementioned rates. All export stops about the middle of April, or sooner if the season is exceptionally dry, on account of danger to the forests from fire. The chief uses of this grass are—

- "(1) for rope-making;
- (2) for small brooms;
- (3) for paper-making.

"(1) *For rope-making.*—The ropes are manufactured in nearly all the villages in the vicinity of the forests, and also in the Saharanpur, Meerut, and Bulandshahr districts. In the villages in the vicinity of the forests, as a rule, only small ropes are made, used for thatching and making the common native bedsteads. This rope sells in the villages at one rupee per 30 to 35 seers; when taken to Saharanpur it realizes about ₹1 per 30 seers, and when to Dehra Dun ₹1 per 30 to 25 seers, these being the bazar rates.

"When taken down to the Meerut and Bulandshahr districts, the Ganges canal is made use of for conveyance, the grass going down in boats from Haridwar and Jwalapur. The buyers pay about ₹30 per 100 maunds at Jwalapur, and the canal freight down to the abovementioned two districts is ₹5 to ₹7-8 per 100 maunds. The prices obtained at Meerut and Bulandshahr vary from ₹60 to ₹80 per 100 maunds. On the canal heavy ropes and hawsers are manufactured for towing.

"(2) The next use that the grass is put to is the manufacture of small brooms for sweeping out houses, etc. These are sold in all the villages in the vicinity of the forests at the rate of 4 or 5 brooms to the anna.

"(3) The third use that the grass is put to is for paper-making. The paper manufactured is the yellow native paper used in all native correspondence and in the bazars. It is only in the neighbourhood of the Ganges canal and the Oudh and Rohilkhand Railway that grass is exported for paper-making. The details of prices, etc., are difficult to obtain, but from enquiry among the contractors the following account may, perhaps, be taken as fairly correct :—

"Formerly, about 10,000 maunds used to go down the canal and railway to Lucknow, the price obtainable there being ₹100 to ₹125 per 100 maunds of grass. The grass went by canal as far as Cawnpore and thence by rail. The canal rates were ₹17 to ₹20 per 100 maunds, and the railway freight about ₹20 per 100 maunds. This export has now practically ceased, as Lucknow obtains most of its grass from the forests of the Ganges Division, which is taken to the Chandausi Station and thence by rail.

"At the present time the grass from the Saharanpur Division is used by the Scindia Paper Mills, Gwalior, but the railway freight is so heavy (about ₹70 per 100 maunds) that no considerable trade takes place.

"This grass is eaten in the hills by cattle, and appears to contain a fair amount of nourishment.

"As regards the development of the trade in Bhabar grass from the Saharanpur forests, the outlook is not promising owing to the grass becoming dry and withered from fire-protection. This is probably the reason why the Lucknow mills do not now take grass from Saharanpur to any considerable extent. The grass from the Ganges Division is still good, as many parts of the forests are annually burnt over, with the result that a fresh crop of green grass springs up.

"If some Native or European capitalist were to set up paper mills at Jwalapur near the railway, and where there is unlimited water-power, they would probably pay very well."

In regard to the question of the effects of fire-protection on the demand for this grass, I can only say, from personal experience, that the amount which is still cut and exported from the forests of the southern face of the Siwaliks is very large indeed. I have several times visited the cutters in the forests, and find that, as they cut pretty regularly in the same places every year, the difficulty which

Mr. Mercer refers to is almost entirely obviated. But, in spite of the large amounts exported, the possible supply from the Siwaliks is so enormous that there is no chance of the grass becoming scarce under the protection of the forests from fire. The cutters can easily sift out the old leaves from the new, and do so, and so long as each tuft is cut yearly, the number of these dry leaves is very small. It must not be supposed that Mr. Mercer is desirous of advocating the cessation of fire-protection: he merely refers to the effect of fire being useful in facilitating growth of new leaves. Fire-protection would be a necessity of forest conservancy, even if its result were to destroy the trade in Bhabar. The annual yield from the Saharanpur Siwaliks is about 75,000 maunds, yielding a royalty to the contractors who lease the sale of produce of about Rs. 6,000.

In the Dehra Dun hills there is of course a good deal of the grass on the Siwaliks near the crest of the hills, and it may also be found more sparingly on low dry slopes of the Himálaya; but there is no export demand, and the grass is only utilized for local purposes.

A considerable amount of information has also been received from the Central Circle of the North-Western Provinces. In 1889 Mr. C. Bagshawe, the Conservator, wrote as follows:—

"Bhabar grass can be cut and exported from the Government forests between the Sarda and Ganges any time between 1st November and 1st March. The most accessible forests are—

"(a) in Kumaon Division near Haldwani, Rohilkhand and Kumaon Railway;

"(b) in Garhwal Division near Kalagarh, 20 miles from Nagina, Oudh and Rohilkhand Railway;

"(c) in the Ganges Division near Chila, 4 miles from Hardwar, Oudh and Rohilkhand Railway.

"The current rates for the grass are as follows:—

	R	a.	p.		R	a.	p.
"Per cart bullock . . .	0	6	0	Per pony . . .	0	2	0
" " buffalo . . .	0	8	0	" donkey . . .	0	1	6
" camel . . .	0	5	0	" banghy . . .	0	1	3
" buffalo . . .	0	2	6	" head-load . . .	0	0	9
" bullock . . .	0	2	0	" maund . . .	0	1	6

"The export of Bhabar grass is fairly large, and in addition to ordinary exports about 10,000 maunds have for some years past been removed for paper mills in Lucknow. I cannot give reliable figures as to cost, but believe the mills give Rs. 1-2 per maund (82 lbs.) delivered at Lucknow. The grass is cut and delivered by contractors. The grass is usually cut and stored at depôts at the foot of the hills by hill men, and is sold at varying rates to buyers who come up from the plains. Any one is free to cut and export Bhabar on payment of the dues. I doubt if Bhabar grass could be exported from India at a profit in competition with Esparto and other grass."

To this Mr. A. E. Wild, Conservator, has now added the information that, besides the manufacture of paper, of ropes, and brooms, it is also used in the making of mats, for thatching, and for caulking the planking of floors; and he has supplied the following interesting table showing the amounts exported and royalty realized on Bhabar grass in the three chief

divisions of his circle in which lie the forests of the outer Himalaya and the hills which continue the Siwaliks, *viz*, the Ganges, Garhwal and Kumaon :—

Year.	Division.	Quantity exported.	Royalty realized.
		Mds.	Rs
1889-90	Ganges	49,985	2,951
1890-91	"	32,409	2,190
1891-92	"	34,059	2,474
1889-90	Garhwal	43,649	3,411
1890-91	"	40,554	2,611
1891-92	"	30,285	2,061
1889-90	Kumaon	16,587	1,153
1890-91	"	7,147	509
1891-92	"	3,125	229
TOTAL .		2,57,800	17,589

From the Oudh Circle the following interesting note on "Baib" grass has been communicated by the Conservator, Mr. S. Eardley-Wilmot, whose remarks on the effect of fire-protection in causing the trees to grow and give a shade which is detrimental to the grass will be read with interest:—

"Baib grass is found growing almost exclusively on the poorer soils and open forests and on broken ground, richness of soil and shade being apparently inimical to its growth. The extension of fire conservancy has reduced the area on which the extraction of this grass can be carried on remuneratively; for, not only does such protection result in improvement of the soil and its more complete overshadowing, but also the fact that the new and old crop cannot be separated in the cutting reduces the value of the outturn considerably. In fire-protected forests, where the Baib crop is of importance to the neighbouring community, this latter fact may often account for persistent and otherwise inexplicable incendiarism. The outturn of Baib in the various divisions of the Oudh Circle varies most considerably, being dependent not on the area but on the physical condition. In the Philibit and Bhira Divisions there are large areas of grass land on which the Sal tree, consequent on the presence of a stratum of clay at a short distance from the surface, appears as a shrub only. In other places the same effect is produced on large areas once cleared for cultivation or by injudicious fellings, and thereafter so maintained by the continuous action of frost and fire. On such areas the growth of Baib is luxuriant, and its extraction provides a useful industry to the neighbouring tenantry, who are accustomed to cut the crops on a system by which Government receives a part of the outturn in payment for the balance, which is removed for domestic requirements or for sale.

This however is now being altered for a more manageable system of leasing the grass on certain areas.

"In the Kheri Division of the Circle there is practically no baib export. In the Bahraich Division along the edge of the Sal forests, in the poorer soil of the Bhinga Range, and in the country at the foot of the low hills, there is a very considerable growth of Baib, which is in part cut departmentally and carted to the nearest railway station, where it is taken over by the agents of the paper mills, who consign it to its destination. Great progress has been made in this division in the export of this grass; presses have been erected (for the railway freight of unpressed grass is prohibitive), and it is hoped that next season the agents of the mills will lease the Baib-producing areas and arrange all cutting and carting without departmental aid. In the Gonda Division, where the main forests are on spurs of the outer ranges of low hills, there is also a large production of Baib, which is not fully utilized owing to the difficulties attendant on reaching the railway. In the Gorakhpur Division the export of Baib is insignificant. The export of Baib last season was approximately as follows:—

	Mds.
"Philibit and Bhira	4,000
Bahraich	8,964
Gonda	2,086

"The highest price obtained was Rs. 1-6 per maund. The average sale price amounted to 18 annas per maund, and it may roughly be said that the sale price of one maund of sound Baib delivered on the railway line is from 12 to 15 annas. The export of the grass is, capable of considerable, but not indefinite, extension. With improvement of communications, there is no doubt but that the whole crop in the Oudh Circle will gradually be utilized, either in local industries or in paper manufacture. The mills which purchase Baib from this circle are the Couper Mills in Lucknow and the Bally and Titagarh Mills in Calcutta."

In the Central Provinces the grass, locally called "Babbai," is widely distributed, but is most especially found in the northern districts. Colonel Doveton, Conservator of Forests, Southern Circle, reports that—

"As far as I have been able to ascertain, the available supply in these provinces is fully utilized for local purposes. The consumption for string cots is very considerable, and it is preferred by the poorer classes to anything else for this purpose."

The following notes have been received from other Forest Officers in the Central Provinces:—

"In the Wardha District it apparently does not exist at all, and in Nagpur only in the East Pench Range, where it is known under the names of Soma and Babara grass.

"Its distribution is irregular, but it is found best developed in the fire-protected forests of the Sylari Khappa Block, and to the west of this, more especially in the vicinity of Nallas.

"It is principally, if not solely, utilized for the manufacture of ropes of all sizes employed in field work, in the construction of country cots and carts, and in thatching.

"It is sold, not as collected, by cart or head-load, but by bundles, at the rate of Rs. 1 per bundle, or at from 2 to 4 annas per country cot.

"The grass is apparently but little known among the people, and its uses are inconsiderable." (H. S. Ker Edie, Forest Divisional Officer, Nagpur, Wardha Division.)

"This grass, I believe, is the same as the *Bhabar grass* mentioned in the memorandum by Mr. Mercer. It is found in all the forests of this district, on the hills and where the ground is slightly elevated and broken, not on low level ground.

"It is in demand for making strong twine in the manufacture of native bedsteads and for thatching, as mentioned by Mr. Mercer. It is not much used for large ropes, and is considered to rot on exposure to wet; when exposed on the outside of a thatch it requires renewing annually. It is not much used for brooms, it being

considered inferior to *Chir* grass for this purpose. It is however occasionally used for making brooms when 'Chir' is not available, but is not considered a marketable commodity. Baghai is not taken in this district, at least for paper-making.

"Baghai is at present included in the general head 'Grass,' and no separate account is taken of the quantity extracted. The rates charged are head-load R0-3-6, kavar-load R0-3-9, cart-load R3-6 for "thatching grass," and under these rates it is extracted, usually in head-loads and kavar-loads.

"Twine made from Baghai sells in the villages at 3 annas per gurna or bundle of 2 or 2½ seers. In Bilaspur much the same rates prevail." (A. W. Blunt, Forest Divisional Officer, Bilaspur.)

"The vernacular name of this grass here is 'Wawit.' It is found in fair quantities in the south of the district, confined to rocky beds of streams and along the slopes of hills in Sironcha and Ghoto, which are broken up and open. The time of flowering is somewhat earlier here than in the Siwaliks. I have seen it in flower in January and February in the hills of Sironcha.

"All the 'Wawit' grass-producing areas lie across the Weinganga river, and here commutation is in force, so that the villagers who cut and bring the grass out of the forest pay nothing extra to the 8 annas per house a year charged them. However, a fair quantity is also brought across the Weinganga in carts for rope-making, and for this 2 annas a cart-load is charged. The men who bring out the grass are chiefly Gonds and Marias, and it is made by them into rope and sold to Kunbis and others for grain generally. The rope seldom exceeds a quarter of an inch in diameter, and is generally one-eighth of an inch. The finer kind of rope is used by the poorer classes for stringing beds, but owing to the immense quantity of fine rope made from other good kinds of fibre, such as that obtained from 'Butes,' the 'Roselle' (which is very largely grown in villages trans-Weinganga), 'Hardwickia' and a few other trees, the 'Wawit' grass rope is not largely used for this purpose by the Kunbis and better classes of villagers. The most extensive use to which this grass is put is for making rough rope for stretching over the fields when the winter crop of 'Jawari' is beginning to ripen. This is done to prevent the birds destroying the grain while in the standing head. To one not accustomed to the sight it seems strange that such labour and trouble should be taken to keep off birds, but such is the case, and it is quite a sight passing along the Pranbita and Godavari rivers to see the miles and miles of rope all made from 'Wawit' grass strung up in the air and reaching to posts at all corners of the 'Jawari' fields from a centre machan erected for the keeper of the field. On seeing birds alight in his field he pulls the strings leading to that particular part, and on pulling these strings sets off rattles attached to the fastening on the outside edge of the field.

"Owing to the ease with which other fibres are obtained and their quantity no trouble is taken in the manufacture of good string from 'Wawit' grass." (A. E. Powrie, Forest Divisional Officer, Chanda.)

"Bhabar grass is called 'Panassi' in this district by the Uriyas. It is found in the Kulohar, Charhalikaman, Beherakaman, Birsing, and Ghichamura Reserves of the Sambalpur Range. These reserves occupy about 120 square miles. The grass is rarely, if ever, met with in the Barapahars. It grows principally in tufts on broken and more or less shingly soil.

"The new crop of grass springs up during the rains between 1st July and 31st October, and is fit for cutting in November and December. It is usually cut during the month of November, and exported by head-loads and kavar-loads, the rates being 2 pies per head-load and 3 pies per kavar-load, which is too low.

"The grass is converted into thin rope for thatching and for native cots and into thick rope for other purposes. The people living in the villages close to the forests are the ones who bring it out and convert it into rope. The grass itself, or the rope made out of it, is sold at Sambalpur, Dawa, Manesar, and Putiapali. The rates vary according to the season of the year. From November to February grass is sold at 5 annas per maund, during March and April at 6½ annas per maund, and in May, June, and July at 10 annas per maund.

"When manufactured into rope one maund is sold at R2-8, R3-4 and R5, according to the season of the year as above.

"The amount exported from the Sambalpur Government Forests annually is about 2,500 maunds. About 2,000 maunds are also brought into the district from Bamra and Gadloising.

"There are no paper mills in this district, and the grass is not exported to any other district for sale. The quantity available is sufficient only for the local demand." (J. J. Hobday, Forest Divisional Officer, Sambalpur.)

"The grass in this part of the country is commonly known as *Son*, and chiefly used in rope-making. The rope made of it is called *ban*, and used largely for native bedsteads, and very rarely for other purposes. It lasts for a considerable length of time, but when exposed to rain, or comes frequently in contact with water, it rots and becomes useless. It is found only in well-drained localities, and grows generally in isolated turfs.

"The produce in this district is removed only under licenses. The quantity thus removed and the revenue realized therefrom for the last year 1891-92 are noted below :

	R	a.	p.
"2,803 head-loads at 1 anna each	175	3	0
3,248 kawar-loads at 1 anna 6 pie each	304	8	0
Total	479	11	0

"This grass when freshly cut is left to dry for a couple of days, and then removed in bundles and made into ropes, varying in size according to requirements. It takes over a week for a man to prepare *ban* of one head-load of the grass, and the *ban* so prepared is sold at markets in vicinity of forests at the rate varying from 16 to 21 khandis to a rupee.

"Forty khandis are generally obtained from each head-load, and each khandi consists of 20 ropes, each 80 feet long. An ordinary bedstead requires about 10 khandis of *ban*, which costs at the above rates from annas 10 to 7½." (Khem Sahib Munshi Muhammad Ghouse, Forest Divisional Officer, Balaghat.)

- The following contribution is from Mr. R. H. E. Thompson, the Conservator of Forests of the Northern Circle :—

"The grass is found sparingly distributed, in favourable localities, throughout the Central Provinces, being confined generally, to the steep and almost bare hill-sides and ravines bordering the large river systems. It is nowhere found in a single locality in any large quantity ; but because of its wide distribution over the enormous forest area of the Central Provinces, it would be safe to say that from 15,000 to 20,000 maunds of this grass, if a demand arose for it, could be collected yearly. It is reported from Mandla that the estimated yield of this grass from that Forest Division alone is 2,500 maunds.

"As regards its uses in the Central Provinces, these are confined to rope-making and the twisting into fine cord for the webbing of native bedsteads. Large quantities are collected for these purposes, and used up yearly by the resident population. None of it, however, is ever exported to places outside of the Central Provinces. The forest value of a head-load of this grass varies, according to the locality which furnishes it, from one anna to two annas.

"Fire-protection has as yet nowhere caused the disappearance of this grass, this being principally owing to its habitat, though the annual regrowth of it is more or less arrested in development owing to the presence within the clump of the dead blades of previous years."

From Bengal information has been received, through the kindness of the Conservator of Forests, Mr. E. P. Daney, from the Divisional Forest Officers of Singhbhum and Palamau in Chota Nagpore. The former writes :—

"This grass, known locally as "*Sabai*," grows most luxuriantly on dry sunny slopes and exposed situations. With the advent of the rainy season it begins to shoot out in tufts from the old clumps, and is mature in the months of October and

November, flowering in March and April, and ripening its seeds in May, when it curls up and dries.

"It grows abundantly in all the forests of Singhbhum. The fresh shoots are eaten by cattle. It is made into ropes, and is used in thatching and for native beds; and paper is also manufactured from it, principally the coarse yellow kind. It is sold departmentally at the following rates :—

" R1 per cart-load	=	about 10 maunds
Annas 6 per sagar-load	=	4 to 5 maunds
" 2 per banghy-load	=	1½ maunds
Anna 1 per head-load	=	½ maund.

"It has been exported from Singhbhum by the Bally, Titaghar, and Ranigunj Paper Mills. It is difficult to obtain exact information as to the cost of export; but the following rates per maund are probably very nearly accurate, the nearest railway station being supposed to be about 20 miles distant from the forest whence the grass is obtained and 272 miles from Calcutta :—

	H	a.	p.	
" Royalty	0	1	8	per maund.
Cutting and drying at depôt near forest	0	4	0	"
Packing and pressing by machinery	0	2	0	"
Carriage to railway station by cart	0	3	0	"
Freight to Calcutta by rail	0	5	0	"
Contingencies	0	0	4	"
TOTAL	1	0	0	"

"The grass delivered at Calcutta realizes from R1-4 to R1-10 per maund. The rates at Chaibassas are as follows :—

"Unmanufactured grass, 8 bundles (= about ½ seer), 8 pies.
Rope, per bundle (= about ½ seer), 6 pies."

As regards Palamau, Mr. Quinnell says :—

"The Sabai grass is fairly plentiful in this division. It is not met with so frequently, or in so great quantities, as in Singhbhum, and it has little marketable value at present. It flourishes in broken ground on the sides of the hot dry nullahs so frequently met with in open Sal forests, and tufts of this grass may be seen in fissures of clayey ground, which has been caked by the heat, where no other grass can maintain an existence. The chief uses to which this grass is applied locally are—

"(a) for ropes, for the rope work of bedsteads, for drawing water from wells, for tying on thatch, for attaching the yoke to the necks of plough cattle, for dragging clod crushers, for tying branches which form the fencing of fields, for making small fixing nets and nets for catching birds, for tying together and towing bamboo rafts, etc. etc. The rate is from 2½ annas to 3 annas per seer, according to thickness of rope.

(b) for small brooms. These are sold at 6 and 8 to the anna.

(c) for making "moras" or large receptacles for grain. These are not sold in the bazars, but are made by villagers as occasion requires.

"The bazar rate for the grass itself is one anna per bundle, about 9 inches in circumference, four of which go to the seer. The existing rates for Sabai grass from the reserved forests of this division are 3 pies per head-load and 4 annas per cart-load. The export at present is very small, and there is little local demand from Government forests, as there is an ample supply of the grass in 'village forests.' 'Mallahs,' a class of men who trade in bamboo and catechu, float down small quantities on their bamboo rafts to the markets above mentioned between the months of July and December, when there is sufficient water in the Koel river. With the removal of obstructions in the Koel river and the improvement of communications generally, there is no doubt that there will be a considerable increase in the amount exported."

If the Sonthal Parganas the grass is common, and is very largely used by the Sonthals, who also, as the present writer has seen in several places, cultivate it for their own use. In the Proceedings of the

Agricultural and Horticultural Society of India for October 1887 the Revd. H. P. Boerresen of Rampore Hât, wrote as follows on the subject:—

"The Sabai or Babul grass yields two crops in the year—one in September and the other at the end of October or early in November—without any irrigation, as the rainy season is then prevalent. It might yield a third cutting if irrigated; but I cannot say anything on this head, never having made the experiment, nor have I seen it attempted by others.

"I believe it will grow anywhere, as we have transplanted it from here to all our other outstations in the Sonthal Parganas, and it thrives in them all. The Sonthal Christians have also taken some of it to our Christian colony in Guma Duar, Assam, where it also grows well.

"I have never attempted to propagate it by seed, but always by roots. When a clump or tuft is dug out, it may be divided into as many small divisions of roots as one pleases; and these are put down again in rows about 3 feet from one another, and the same interval between each root planted. It will yield a very trifling return the first two years, but by the third or fourth year, when the roots have spread and multiplied, it gives a good crop. The plot on which it is planted must be kept free from other grass. When it is seven or eight years old, the roots should be beaten down with wooden mallets, or a plough should be run through them in every direction, and fresh earth thrown over the whole increases the yield. If not treated in this way, it will cease yielding any crop. When grown too old, it must be taken up entirely, re-divided in small bunches of roots, and transplanted to a fresh locality.

"We brought the grass always in local *hâts* for roofing purposes (as rope) before we grew our own, and nowhere in our neighbourhood am I aware of its being cultivated in any but very small patches by a solitary man here or there. It is not cultivated as a source of income or trade, so that I am unable to say where the roots may be bought or at what price. We got a small quantity of the roots originally from a Hindu village, but by fostering and spreading their cultivation have now a considerable quantity. It should be planted in a dry spot where no water lodges, as experience has shown in one of our stations, where the water oozed up from below and rotted the roots so that it would not grow there. A sloping site is probably the best.

"When we first started the mission here we had to pay R4 a maund in the *hâts* for the grass in order to twist it into rope or string, and it was the having to pay so much that led me to try and cultivate it ourselves. The grass runs to seed in the hot months shortly before the rainy season, but these must be cut off and removed or the crop will deteriorate."

In regard to its growth and the trade in it in the Madras Presidency, Mr. E. D. M. Hooper, the Conservator of Forests of the Northern Circle, writes as follows, chiefly in regard to the Ganjam District, where the grass is extremely common, and where many attempts have been made, both by Government and by private firms, to bring it to the Calcutta market. Nearly all these attempts failed owing to the heavy charges for freight made by the British Indian Steam Navigation Company:—

"I send you the following extract from a letter received from Ganjam regarding Babul grass.

"When Mr A. W. Lushington was Divisional Forest Officer, a quantity of grass was collected and sent to Calcutta. The experiment was not a success, and I am given to understand that the chief obstacles were—

1st.—The small quantity obtainable and the limited period in which it was procurable.

2nd.—The inferior quality as compared with the sample sent.

3rd.—And, chiefly, the enormous cost of transit from where it is procurable to the coast and freight to Calcutta.

"I have made enquiries, and estimate the cost as follows. —

	Per ton.
	<i>R. a. p.</i>
"1. Cost of collecting and delivery in Russelkonda	. 5 5 0
2. Carriage to Gopalpore . . . . .	. 11 8 0
3. Pressing in Gopalpore . . . . .	. 5 0 0
4. Freight to Calcutta . . . . .	. 6 0 0
5. Incidental expenses . . . . .	. 2 0 0
Cost per ton delivered in Calcutta	. 30 0 0

"I calculate that we could collect during six or seven months in the year, and during this time we could deliver in Russelkonda about 800 tons, but, so long as we have the very high transit charges to the coast, I do not think it would pay. A press in Russelkonda would be advantageous. It would save us 50 per cent. transit charges, besides reducing charges in pressing. With a press in Russelkonda, I think we could deliver in Calcutta at about ₹23 per ton. I cannot find out what we could get for grass per ton in Calcutta. A private press says that they now lay down a press, building included, for about ₹3,000 to ₹3,500, to turn out 20 to 25 bales a day if we would undertake to deliver to them in Russelkonda about 1,000 tons of grass yearly.

"The best thing to do would be to get some private firm either to pay us so much the cart-load of grass removed by them from the forests or take delivery from us in Russelkonda.

"We are trying to find out what market there is for the grass in Calcutta, and I will let you know later on what can be done here.

"From Godávri I learn that one viss or 8lbs. of the rope sells for two annas, and the material is chiefly used in native bedsteads. It is further stated that the grass is only found in patches along the Agency border of the district, and so distributed, that the quantity available could not be brought to a central press with profit."

The following information has been communicated by Mr. C. D. McArthur, District Forest Officer of Vizagapatam:—

"This product is known in the northern parts of the district under the name of 'Kopiri' grass. It is found in the forest at the foot of the Palkonda Agency hills, and also on the 1,500-foot plateau above.

"The cutting is done from October to December, but the later the cutting, the less useful is the grass on account of increased brittleness.

"A kavadi-load of green grass weighs about 50lbs., and fetches from 4 to 5 annas in the villages close to the forest. The grass is utilized only for the manufacture of ropes. It is first dipped in water for about an hour, and is then beaten with sticks with the object of separating out the fibre, which is then made into ropes of various thickness.

"Fine rope is used by the poorer people for cots, and is sold in coils of 3 to 4lbs., sufficient for one cot, for one 1½ annas.

"Stouter rope, about 2½ inches in girth, is used by ryots for binding bundles of seed paddy and other grains, and also for cattle ropes."

All the information collected goes to show that the grass is a valuable product for paper-making, and that it can be easily cultivated if necessary. The Deccan Paper Mills are about to try the cultivation with roots obtained from the Siwaliks. As an article of export trade, it is doubtful if it will ever come into much use owing to the long distances of land transport which will be necessary and its comparative bulk even if pressed, but for Indian paper-making it has most probably a great future before it, and it deserves to be widely known and utilized.

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